# JOURNAL

OF

# BACTERIOLOGY

VOLUME 113

BALTIMORE, MD. 21202

1973

# JOURNAL OF BACTERIOLOGY

VOLUME 113 • 1973

## EDITORIAL BOARD

**L. LEON CAMPBELL**, Editor-in-Chief (1975)
*University of Delaware, Newark*

**R. L. ANDERSON**, Editor (1975)
*Michigan State University, East Lansing*

**ROY CURTISS III**, Editor (1974)
*University of Alabama, Birmingham*

**S. G. BRADLEY**, Editor (1974)
*Virginia Commonwealth University, Richmond*

**ALLEN G. MARR**, Editor (1973)
*University of California, Davis*

**H. E. UMBARGER**, Editor (1976)
*Purdue University, Lafayette, Ind.*

---

**Martin Alexander** (1972)
**W. Lane Barksdale** (1975)
**M. E. Bayer** (1975)
**Blaine Beaman** (1976)
**Claire M. Berg** (1973)
**Richard S. Berk** (1974)
**Robert W. Bernlohr** (1973)
**B. Wesley Catlin** (1974)
**D. Joseph Clark** (1974)
**Stanley N. Cohen** (1973)
**Ronald S. Cole** (1974)
**S. F. Conti** (1975)
**Walter J. Dobrogosz** (1973)
**Martin Dworkin** (1973)
**R. G. Eagon** (1974)
**Alan D. Elbein** (1973)
**Wolfgang Epstein** (1974)
**Stanley Falkow** (1975)
**Gerald R. Fink** (1975)
**A. T. Ganesan** (1975)
**Howard Goldfine** (1975)
**Harry Gooder** (1975)
**Joseph S. Gots** (1975)
**Harlyn O. Halvorson** (1975)
**F. M. Harold** (1973)
**George Hegeman** (1974)
**Donald R. Helinski** (1975)
**Charles E. Helmstetter** (1975)
**Robert K. Herman** (1974)
**Joseph T. Holden** (1975)
**Stanley C. Holt** (1974)
**John Ingraham** (1973)
**Sam Kaplan** (1974)
**David E. Kennell** (1974)
**Robert L. Lester** (1975)
**Hillel S. Levinson** (1975)
**E. C. C. Lin** (1975)
**Michael H. Malamy** (1975)
**Manley Mandel** (1975)
**David Mardon** (1974)
**Alvin Markovitz** (1973)
**M. L. Morse** (1975)
**Eugene W. Nester** (1975)
**Richard P. Novick** (1973)
**Leo Parks** (1973)
**Martin Pato** (1975)
**Allen T. Phillips** (1973)
**Lewis I. Pizer** (1975)
**Jack Preiss** (1974)
**Charles C. Remsen III** (1973)
**William S. Reznikoff** (1973)
**H. V. Rickenberg** (1973)
**Antonio H. Romano** (1973)
**John Roth** (1973)
**Harold L. Sadoff** (1974)
**M. R. J. Salton** (1975)
**David Schlessinger** (1974)
**Carl Schnaitman** (1974)
**Jane K. Setlow** (1975)
**Stanley K. Shapiro** (1976)
**Simon Silver** (1973)
**W. R. Sistrom** (1972)
**Lucile Smith** (1972)
**Paul S. Sypherd** (1974)
**A. L. Taylor** (1974)
**Arthur Weissbach** (1974)
**N. E. Welker** (1973)
**Meyer J. Wolin** (1973)
**Frank E. Young** (1973)
**Stanley A. Zahler** (1974)

---

**ROBERT A. DAY**, *Managing Editor, 1913 I St., N.W., Washington, D.C. 20006*

---

## EX OFFICIO

**R. G. E. MURRAY**, President (1972-1973)
**DONALD E. SHAY**, Secretary

**L. LEON CAMPBELL**, Vice-President (1972-1973)
**T. J. CARSKI**, Treasurer

The *Journal of Bacteriology*, a publication of the American Society for Microbiology, 1913 I St., N.W., Washington, D.C. 20006, is devoted to the advancement and dissemination of fundamental knowledge concerning bacteria and other microorganisms. The *Journal* is published monthly, and the twelve numbers are divided into four volumes per year. The subscription price is $75 (Postal Union Countries, $77; other foreign, $78) per year. Single copies are $7.00 (foreign, 7.25). Members of the American Society for Microbiology may receive the *Journal* as part of their dues. Correspondence relating to subscriptions, reprints, defective copies, availability of back issues, lost or late proofs, disposition of submitted manuscripts, and general editorial matters should be directed to the ASM Publications Office, 1913 I St., N.W., Washington, D.C. 20006 (area 202 833-9416). Correspondence from ASM members relating to membership dues, member subscriptions, changes of address, incorrect journals, etc., should be directed to the Executive Secretary, American Society for Microbiology, 1913 I St., N.W., Washington, D.C. 20006. Published monthly by the ASM at 428 E. Preston St., Baltimore, Md. 21202.

Second class postage paid at Baltimore, Md. 21202, and at additional mailing offices.

Made in the United States of America.

Copyright © 1973, American Society for Microbiology.
All Rights Reserved.

## Ecology

Serological Study of Nocardia by Using Mycobacterial Precipitation Reference Systems. Malin Ridell and Margareta Norlin ..... 1
Amino Acid Sequence of the Threonine-Containing Mureins of Coryneform Bacteria. Franz Fiedler, Karlheinz Schleifer, and Otto Kandler ..... 8
Serological Relatedness of Bacterial Deoxyribonucleic Acid Polymerases. Susan W. Tafler, Peter Setlow, and Lawrence Levine ..... 18
Ecology of *Vibrio parahaemolyticus* in Chesapeake Bay. Tatsuo Kaneko and Rita R. Colwell ..... 24
Survival of *Arthrobacter crystallopoietes* During Prolonged Periods of Extreme Desiccation. Charles W. Boylen ..... 33
Differentiation of Some Enterococci by Gas Chromatography. Charles F. Amstein and Paul A. Hartman ..... 38

## Morphology and Ultrastructure

Regulation of Flagellar Morphogenesis by Temperature: Involvement of the Bacterial Cell Surface in the Synthesis of Flagellin and the Flagellum. Estelle J. McGroarty, Henry Koffler, and R. W. Smith ..... 295
Homogeneity of Envelope Proteins of *Escherichia coli* Separated by Gel Electrophoresis in Sodium Dodecyl Sulfate. Masayori Inouye and Mei-Lan Yee ..... 304
Development of a Quantitative Immunological Assay for the Study of Spore Coat Synthesis and Morphogenesis. Diane Horn, A. I. Aronson, and E. S. Golub ..... 313
Spin-Labeling Studies on the Membrane of a Facultative Thermophilic Bacillus. May Chan, Y. P. Virmani, R. H. Himes, and J. M. Akagi ..... 322
Comparative Transport Activity of Intact Cells, Membrane Vesicles, and Mesosomes of *Bacillus licheniformis*. Robert A. MacLeod, Paul Thurman, and H. J. Rogers ..... 329
Electron Microscopy of Some Special Cell Contacts in Yeasts. N. J. W. Kreger-Van Rij and M. Veenhuis ..... 350
Electron Microscope Observations on the Effects of Polymixin B Sulfate on Cell Walls of *Chlamydia psittaci*. Akira Matsumoto, Noboru Higashi, and Akira Tamura ..... 357
Comparative Studies on the Isolation of Membrane Lipoteichoic Acid from *Lactobacillus fermenti*. A. J. Wicken, Janet W. Gibbens, and K. W. Knox ..... 365
Changes in the Lipid Composition and Fine Structure of *Saccharomyces cerevisiae* During Ascus Formation. R. F. Illingworth, A. H. Rose, and A. Beckett ..... 373
Ultrastructure of Free-Living and Nitrogen-Fixing Forms of *Rhizobium meliloti* as Revealed by Freeze-Etching. C. R. MacKenzie, W. J. Vail, and D. C. Jordan ..... 387
Biotin Deficiency in *Arthrobacter globiformis*: Comparative Cell Ultrastructure and Nonreplacement of the Vitamin by Structurally Unrelated Compounds. E. C. S. Chan, B. Zyk, and M. Gomersall ..... 394
Phycobilisomes in *Anacystis nidulans*. Elisabeth L. Evans and Mary M. Allen ..... 403
Ultrastructural Alterations Associated with the Growth of Resistant *Pseudomonas aeruginosa* in the Presence of Benzalkonium Chloride. Hans-Peter Hoffmann, Sam G. Geftic, Justus Gelzer, Hans Heymann, and Frank W. Adair ..... 409
Freeze-Etch Study of *Pseudomonas aeruginosa*: Localization Within the Cell Wall of an Ethylenediaminetetraacetate-Extractable Component. H. E. Gilleland, Jr., J. D. Stinnett, I. L. Roth, and R. G. Eagon ..... 417
Ultrastructural Properties of the Extra Membranes of *Escherichia coli* O111a as Revealed by Freeze-Fracturing and Negative-Staining Techniques. R. A. Weigand, S. C. Holt, J. M. Shively, G. L. Decker, and J. W. Greenawalt ..... 433
Freeze-Etching and X-Ray Diffraction of the Isolated Double-Track Layer from the Cell Wall of a Gram-Negative Marine Pseudomonad. A. Forge, J. W. Costerton, and K. Ann Kerr ..... 445
Electron Microscopy of Colicin I-Producing Cells. Richard E. Isaacson and Jordan Konisky ..... 452
Fine Structure of *Methanobacterium thermoautotrophicum*: Effect of Growth Temperature on Morphology and Ultrastructure. J. G. Zeikus and R. S. Wolfe ..... 461

Morphological and Structural Changes During the Yeast-to-Mold Conversion of *Phialophora dermatitidis*. KAREN B. OUJEZDSKY, STANLEY N. GROVE, AND PAUL J. SZANISZLO ..... 468
Reversal by Aromatic Amino Acids of 2-Thiazole-DL-Alanine Inhibition of *Salmonella typhimurium*. M. B. BAHRAMIAN AND R. B. MIDDLETON ..... 504
Cell Wall of *Mycobacterium lepraemurium* Strain Hawaii. ICHIRO AZUMA, YUICHI YAMAMURA, YOSHINORI TANAKA, KENJI KOHSAKA, TATSUO MORI, AND TONETARO ITOH ..... 515

## Genetics and Molecular Biology

Evidence for the Direct Action of Colicin K on Aerobic $^{32}P_i$ Uptake in *Escherichia coli* In Vivo and In Vitro. YOHTAROH TAKAGAKI, KIYOHIKO KUNUGITA, AND MICHIO MATSUHASHI ..... 42
Glutamate Transport in *Escherichia coli* K-12: Nonidentity of Carriers Mediating Entry and Exit. Y. S. HALPERN, H. BARASH, AND KARNINA DRUCK ..... 51
Characterization of Lethal Zygosis Associated with Conjugation in *Escherichia coli* K-12. RONALD A. SKURRAY AND PETER REEVES ..... 58
Effect on Exclusion of Alterations to the Sex Pilus. ELINOR MEYNELL AND ANNA EWINS ..... 71
Osmotic Reversal of Temperature Sensitivity in *Escherichia coli*. ANNA Z. BILSKY AND JOHN B. ARMSTRONG ..... 76
Specialized Subregions of the Bifunctional *hisB* Gene of *Salmonella typhimurium*. L. L. HOUSTON ..... 82
Genetic Analysis of Repair of Ultraviolet Damage by Competent and Noncompetent Cells of *Bacillus subtilis*. CHARLES T. HADDEN AND DANIEL BILLEN ..... 88
Temperature-Sensitive Mutant of *Escherichia coli* K-12 with an Impaired D-Alanine: D-Alanine Ligase. E. J. J. LUGTENBERG AND ARNA VAN SCHIJNDEL-VAN DAM ..... 96
Genetic Analysis of Flagellar Mutants in *Escherichia coli*. M. SILVERMAN AND M. SIMON ..... 105
Effect of Thymine Starvation on Deoxyribonucleic Acid Repair Systems of *Escherichia coli* K-12. JANET A. ANDERSON AND STEPHEN D. BARBOUR ..... 114
Porphyrin-Accumulating Mutants of *Escherichia coli*. ROGER COX AND H. P. CHARLES ..... 122
Radiation-Resistant Mutants of *Salmonella typhimurium* LT2: Development and Characterization. ROLAND DAVIES AND ANTHONY J. SINSKEY ..... 133
Ultraviolet-Sensitive Mutator Strain of *Escherichia coli* K-12. ELI C. SIEGEL ..... 145
Ultraviolet-Sensitive Mutator *mutU4* of *Escherichia coli* Inviable with *polA*. ELI C. SIEGEL ..... 161
Effect of Alanine, Leucine, and Fructose on Lysyl-Transfer Ribonucleic Acid Ligase Activity in a Mutant of *Escherichia coli* K-12. IRVIN N. HIRSHFIELD AND NAOMI E. BUKLAD ..... 167
Temperature-Sensitive Relaxed Phenotype in a Stringent Strain of *Escherichia coli*. ALAN G. ATHERLY ..... 178
Plasmid-Associated Functions of a Stable *Flac*. FRANCIS L. MACRINA AND ELIAS BALBINDER ..... 183
Synthesis and Structure of *Caulobacter crescentus* Flagella. LUCILLE SHAPIRO AND J. V. MAIZEL, JR. ..... 478
Comutation in *Streptomyces*. ROSALBA RANDAZZO, GIUSEPPE SERMONTI, ANGELO CARERE, AND MARGHERITA BIGNAMI ..... 500
Pseudo-*fi*$^+$ I-Like Sex Factor R62(I), Selective for Increased Pilus Synthesis. ELINOR MEYNELL ..... 502
Isolation of Covalently Closed Circular Deoxyribonucleic Acid from Bacteria Which Produce Exocellular Nuclease. KENNETH TIMMIS AND ULRICH WINKLER ..... 508
Obligate Thymidine Auxotrophs of *Pseudomonas acidovorans*. ROD A. KELLN AND R. A. J. WARREN ..... 510
Characterization of Constitutive Galactose Permease Mutants in *Salmonella typhimurium*. MILTON H. SAIER, JR., FRED G. BROMBERG, AND SAUL ROSEMAN ..... 512

## Physiology and Metabolism

α-Mannosidase and Microcyst Differentiation in the Cellular Slime Mold *Polysphondylium pallidum*. DANTON H. O'DAY ..... 192

Modification of Bacteriophage $\phi$25 Adsorption to *Bacillus subtilis* by Concanavalin A. D. C. Birdsell and R. J. Doyle ..... 198
Effect of Growth Rate on the Macromolecular Composition of *Prototheca zopfii*, a Colorless Alga Which Divides by Multiple Fission. Robert O. Poyton ..... 203
Distribution of a Phosphoenolpyruvate-Dependent Sugar Phosphotransferase System in Mycoplasmas. Vincent P. Cirillo and Shmuel Razin ..... 212
Betaine-Homocysteine Transmethylase in *Pseudomonas denitrificans*, a Vitamin $B_{12}$ Overproducer. Raymond F. White, Louis Kaplan, and Jerome Birnbaum ..... 218
Rapid Regulation of an Anthranilate Synthase Aggregate by Hysteresis. J. F. Kane, W. M. Holmes, K. L. Smiley, Jr., and R. A. Jensen ..... 224
Thymineless Death and Ultraviolet Sensitivity in *Micrococcus radiodurans*. J. G. Little and P. C. Hanawalt ..... 233
Channel-Shuttle Mechanism for the Regulation of Phenylalanine and Tyrosine Synthesis at a Metabolic Branch Point in *Pseudomonas aeruginosa*. David H. Calhoun, Duane L. Pierson, and Roy A. Jensen ..... 241
Ribosomes, Polyribosomes, and Deoxyribonucleic Acid from Thermophilic, Mesophilic, and Psychrophilic Clostridia. Carol C. Irwin, James M. Akagi, and Richard H. Himes ..... 252
Effect of Reversible Inhibition of Deoxyribonucleic Acid Synthesis on the Yeast Cell Cycle. Martin L. Slater ..... 263
Growth and Macromolecular Composition of a Mutant of *Escherichia coli* During Polyamine Limitation. David R. Morris and Caroline M. Jorstad ..... 271
Effect of Lysozyme on Enterococcal Viability in Low Ionic Environments. Robert H. Metcalf and R. H. Deibel ..... 278
Pathways of Carbohydrate Metabolism in *Microcyclus* Species. R. H. Kottel and H. D. Raj ..... 341
Characterization of a Stable L-Form of *Bacillus subtilis* 168. Richard W. Gilpin, Frank E. Young, and Anadi N. Chatterjee ..... 486
Aryl Sulfatase in Ascospores of *Neurospora crassa*. Earl G. Burton and Robert L. Metzenberg ..... 519
Degradation of Protocatechuate in *Pseudomonas testosteroni* by a Pathway Involving Oxidation of the Product of *Meta*-Fission. D. Adele Dennis, Peter J. Chapman, and Stanley Dagley ..... 521
Superoxide Dismutase in *Bacillus popilliae*, a Catalaseless Aerobe. Allan A. Yousten, Lee A. Bulla, Jr., and Joe M. McCord ..... 524
Differential Heat Stabilities of *Bacillus* Amylases. Barry O. Bliesmer and Paul A. Hartman ..... 526

### Enzymology

Partial Purification and Properties of the Pyruvate-Uridine Diphospho-*N*-Acetylglucosamine Transferase from *Staphylococcus epidermidis*. Gary G. Wickus and Jack L. Strominger ..... 287
Partial Purification and Some Properties of the Uridine Diphospho-*N*-Acetylglucosamine-Enolpyruvate Reductase from *Staphylococcus epidermidis*. Gary G. Wickus, Peter A. Rubenstein, Alan D. Warth, and Jack L. Strominger ..... 291

## Volume 113 Contents for February Number 2

### Morphology and Ultrastructure

Membrane Lipids of *Mycoplasma hominis*. Shlomo Rottem and Shmuel Razin ..... 565
Divalent Cations in Native and Reaggregated Mycoplasma Membranes. Itzhak Kahane, Zvi Ne'eman, and Shmuel Razin ..... 666
Structure of Cell Wall Lipopolysaccharide from *Salmonella typhimurium*. IV. Anomeric Configuration of L-Rhamnose Residues and Its Taxonomic Implications. Hiroshi Kita and Hiroshi Nikaido ..... 672
Structure of the Molybdoferredoxin Complex from *Clostridium pasteurianum* and Isolation of Its Subunits. T. C. Huang, W. G. Zumft, and L. E. Mortenson ..... 884

Ultrastructure of the Cell Wall and Cytoplasmic Membrane of Gram-Negative Bacteria with Different Fixation Techniques. M. T. Silva and J. C. F. Sousa ..... 953
Surface Structure of Intact Cells and Spheroplasts of *Pseudomonas aeruginosa*. Richard L. Weiss and Dean Fraser ..... 963
Effect of Phosphate Limitation on the Morphology and Wall Composition of *Bacillus licheniformis* and Its Phosphoglucomutase-Deficient Mutants. C. W. Forsberg, P. B. Wyrick, J. B. Ward, and H. J. Rogers ..... 969
Life Cycle of *Neurospora crassa* Viewed by Scanning Electron Microscopy. Thomas Seale ..... 1015
Abnormal Septation and Inhibition of Sporulation by Accumulation of L-*a*-Glycerophosphate in *Bacillus subtilis* Mutants. Yong K. Oh, Elisabeth B. Freese, and Ernst Freese ..... 1034
Morphology and Ultrastructure of Staphylococcal L Colonies: Light, Scanning, and Transmission Electron Microscopy. Robert J. Fass ..... 1049
Ascospore Wall Development in *Saccharomyces cerevisiae*. A. Beckett, R. F. Illingworth, and A. H. Rose ..... 1054
Surface Distribution of Invertase on Growing *Saccharomyces* Cells. J. S. Tkacz and J. O. Lampen ..... 1073

**Genetics and Molecular Biology**

Inorganic Phosphate Transport in *Escherichia coli*: Involvement of Two Genes Which Play a Role in Alkaline Phosphatase Regulation. Gail R. Willsky, Robert L. Bennett, and Michael H. Malamy ..... 529
Transformation and Transfection in Lysogenic Strains of *Bacillus subtilis* 168. Ronald E. Yasbin, Gary A. Wilson, and Frank E. Young ..... 540
Increasing Activity of Germinating *Bacillus subtilis* Spores to Incorporate Thymidine Triphosphate into Deoxyribonucleic Acid After Detergent Treatment. Yasutaro Fujita, Tohru Komano, and Hiroshi Tanooka ..... 558
Differential Gene Action in *Neurospora crassa*. A. S. Bhagwat and P. R. Mahadevan .. 572
Competence for Transfection in *Staphylococcus aureus*. Jan-Eric Sjöström, Martin Lindberg, and Lennart Philipson ..... 576
Accumulation of Guanosine Tetraphosphate in T7 Bacteriophage-Infected *Escherichia coli*. J. D. Friesen and N. Fiil ..... 697
Two Genetic Loci for Resistance to Kasugamycin in *Escherichia coli*. P. Frederick Sparling, Yoshiko Ikeya, and Donna Elliot ..... 704
Protein Synthesis and Deoxyribonucleic Acid-Membrane Attachment During Thymineless Death in *Escherichia coli*. Frances Dankberg and Donald J. Cummings ... 711
Adenosine Triphosphate-Dependent Deoxyribonuclease from *Diplococcus pneumoniae*: Fate of Transforming Deoxyribonucleic Acid in a Strain Deficient in the Enzymatic Activity. Gerald F. Vovis ..... 718
Host Specificity of *Salmonella typhimurium* Deoxyribonucleic Acid Restriction and Modification. Harvey Slocum and Herbert W. Boyer ..... 724
Isolation and Characterization of Acid Phosphatase Mutants in *Saccharomyces cerevisiae*. Akio Toh-e, Yoshinami Ueda, Sei-Ichiro Kakimoto, and Yasuji Oshima ..... 727
Chromatographically Fractionated Complementary Strands of *Bacillus subtilis* Deoxyribonucleic Acid: Biological Properties. Rivka Rudner and Virgilija Remeza .. 739
Chromatographically Fractionated Complementary Strands of *Bacillus subtilis* Deoxyribonucleic Acid: Transformation of Hybrids. Rivka Rudner and Virgilija Remeza ..... 754
Isolation and Characterization of the Fertility Factor P of *Vibrio cholerae*. Archana Datta, Charlotte D. Parker, J. A. Wohlhieter, and L. S. Baron ..... 763
Host Range and Properties of the *Pseudomonas aeruginosa* R Factor R1822. Ronald H. Olsen and Patricia Shipley ..... 772
Rapid Mapping of Conditional and Auxotrophic Mutations in *Escherichia coli* K-12. Brooks Low ..... 798
Isolation and Partial Characterization of Temperature-Sensitive Mutants in Ten Loci That Affect Cell Membrane Synthesis in *Escherichia coli*: Isolation and Genetic Sorting. G. Nigel Godson ..... 813

Analysis of Isoaccepting Transfer Ribonucleic Acid Species of *Bacillus subtillus*: Chromatographic Differences Between Transfer Ribonucleic Acids from Spores and Cells in Exponential Growth. BARBARA S. VOLD ..... 825
Evidence for the Existence of Two Arginyl-Transfer Ribonucleic Acid Synthetase Activities in *Escherichia coli*. D. W. YEM AND L. S. WILLIAMS ..... 891
Isolation and Characterization of Mutations Affecting the Transport of Hexose Phosphates in *Escherichia coli*. ROBERT J. KADNER AND HERBERT H. WINKLER ..... 895
Involvement of the *recB-recC* Nuclease (Exonuclease V) in the Process of X-Ray-Induced Deoxyribonucleic Acid Degradation in Radiosensitive Strains of *Escherichia coli* K-12. DAVID A. YOUNGS AND I. A. BERNSTEIN ..... 901
Temperature-Sensitive Divisionless Mutant of *Bacillus subtilis* Defective in the Initiation of Septation. XANDRA O. BREAKEFIELD AND OTTO E. LANDMAN ..... 985
Molecular Structure of an R Factor, Its Component Drug-Resistance Determinants and Transfer Factor. CHRISTINE E. MILLIKEN AND R. C. CLOWES ..... 1026
Initiation and Termination of Bacterial Deoxyribonucleic Acid Replication in Low Concentrations of Chloramphenicol. KARL G. LARK ..... 1066
Volatilization of Mercuric Chloride by Mercury-Resistant Plasmid-Bearing Strains of *Escherichia coli, Staphylococcus aureus*, and *Pseudomonas aeruginosa*. ANNE O. SUMMERS AND ELAINE LEWIS ..... 1070
On the Conservation of Aminoacyl-Transfer Ribonucleic Acid Synthetase Genes in *Bacillus*. JAMES A. HOCH AND WILLIAM STEINBERG ..... 1076
Genetic Control of "Flor" Formation by *Saccharomyces*. J. SANTA MARIA AND D. VIDAL ..... 1078
Screening Procedure of *Escherichia coli* Mutants Deficient in Ribonuclease I. S. KAPLAN ..... 1081
Formation of Catenated Colicin Factor E1 Deoxyribonucleic Acid Molecules in a Recombination-Deficient Strain of *Escherichia coli*. JOSEPH W. INSELBURG ..... 1084
Preliminary Mapping of Mutations Affecting Exonuclease III in *Escherichia coli* K-12. CHRISTINE MILCAREK AND BERNARD WEISS ..... 1086

**Physiology and Metabolism**

Physiological Role of Pyruvate Carboxylase in a Thermophilic Bacillus. T. K. SUNDARAM ..... 549
Acyl Carrier Protein in Mycoplasmas. SHLOMO ROTTEM, OFRA MUHSAM-PELED, AND SHMUEL RAZIN ..... 586
Occurrence of Glucosamine Residues with Free Amino Groups in Cell Wall Peptidoglycan from Bacilli as a Factor Responsible for Resistance to Lysozyme. HIDEYUKI HAYASHI, YOSHIO ARAKI, AND EIJI ITO ..... 592
Continuous Culture of *Rhodotorula rubra*: Kinetics of Phosphate-Arsenate Uptake, Inhibition, and Phosphate-Limited Growth. D. K. BUTTON, SALLY S. DUNKER, AND M. L. MORSE ..... 599
Facilitated Diffusion of Monosaccharides in *Saccharomyces cerevisiae*: Experimental Investigation of Kinetic Parameters Without the Assumptions of Symmetry. CAROLYN M. KALSOW AND R. J. DOYLE ..... 612
Control of Pantothenate Accumulation in *Agrobacterium tumefaciens*. TSUNEO KANESHIRO, LARRY O. ARTHUR, AND KENNETH W. NICKERSON ..... 619
Biosynthesis of Glycogen and Starch in *Cryptococcus laurentii*. JOHN C. SCHULTZ AND HELMUT ANKEL ..... 627
Relationships Among Mycobacteria and Nocardiae Based upon Deoxyribonucleic Acid Reassociation. S. G. BRADLEY ..... 645
3-Ketoglucose Reductase of *Agrobacterium tumefaciens*. KOICHI HAYANO, YUKIO TSUBOUCHI, AND SAKUZO FUKUI ..... 652
Glucose-1-Phosphate-Negative Mutant of *Agrobacterium tumefaciens*. SACHIO MIYAIRI AND SAKUZO FUKUI ..... 658
Role of Adenosine 3′,5′-Cyclic Monophosphate and Its Specific Binding Protein in the Regulation of D-Serine Deaminase Synthesis. ELIZABETH MCFALL ..... 781
Ribonucleic Acid and Protein Synthesis During Germination of *Myxococcus xanthus* Myxospores. FREDRICK W. JUENGST, JR., AND MARTIN DWORKIN ..... 786

Interactions of *Tetrahymena pyriformis*, *Escherichia coli*, *Azotobacter vinelandii*, and Glucose in a Minimal Medium. J. L. Jost, J. F. Drake, A. G. Fredrickson, and H. M. Tsuchiya ..... 834
Germination of *Azotobacter vinelandii* Cysts: Sequence of Macromolecular Synthesis and Nitrogen Fixation. Bonnie Loperfido and H. L. Sadoff ..... 841
Effect of Halofenate and Clofibrate on Growth and Lipid Synthesis in *Saccharomyces cerevisiae*. Michael D. Greenspan and John I. Germershausen ..... 847
Regulation of Nigeran Accumulation by *Asperigillus aculeatus*. Michael H. Gold, Duane L. Mitzel, and Irwin H. Segel ..... 856
Levels of Glycogen and Trehalose in *Mycobacterium smegmatis* and the Purification and Properties of the Glycogen Synthetase. Alan D. Elbein and Mike Mitchell ..... 863
Procedure for the Isolation of Mutants of *Bacillus subtilis* with Defective Cytoplasmic Membranes. Claudia Kent, Sharon S. Krag, and W. J. Lennarz ..... 874
Metabolism of D-Fructose by *Arthrobacter pyridinolis*. Mark E. Sobel and Terry A. Krulwich ..... 907
The 503-nm Pigment of *Escherichia coli* B: Characterization and Nutritional Conditions Affecting Its Accumulation. Kenneth Olden and Walter P. Hempfling ..... 914
Stereospecific Enzymes in the Degradation of Aromatic Compounds by *Pseudomonas putida*. William L. Collinsworth, Peter J. Chapman, and Stanley Dagley ..... 922
Time of Enterotoxin Formation and Release During Sporulation of *Clostridium perfringens* Type A. Charles L. Duncan ..... 932
Physiological Studies of Methane- and Methanol-Oxidizing Bacteria: Immunological Comparison of a Primary Alcohol Dehydrogenase from *Methylococcus capsulatus* and *Pseudomonas* sp. M27. R. N. Patel, W. J. Mandy, and D. S. Hoare ..... 937
Novel Mutant Impaired in Cell Division: Evidence for a Positive Regulating Factor. L. O. Ingram and W. D. Fisher ..... 999
Mechanism for the Regulation of Cell Division in *Agmenellum*. L. O. Ingram and W. D. Fisher ..... 1006
Autolysis of *Listeria monocytogenes*. E. A. Tyrrell ..... 1046
Photoprotection by Dipicolinate Against Inactivation of Bacterial Spores with Ultraviolet Light. Nicholas Grecz, Terry Tang, and Hilmer A. Frank ..... 1058
Identification of a Self-Inhibitor from Spores of *Dictyostelium discoideum*. Charles W. Bacon, Alfred S. Sussman, and Ara G. Paul ..... 1061
Absolute Configuration of a Metabolite in the *m*-Fission Pathway of Protocatechuate. Clare Schuld Ritter, Peter J. Chapman, and Stanley Dagley ..... 1064

### Enzymology

Succinate Oxidase in *Neurospora*. David J. West and Dow O. Woodward ..... 637
Kinetics and Regulation of the Salt-Dependent Aspartate Transcarbamylase of *Halobacterium cutirubrum*. P. Norberg, J. G. Kaplan, and D. J. Kushner ..... 680
Properties of D-Arabinose Isomerase Purified from Two Strains of *Escherichia coli*. James R. Boulter and William O. Gielow ..... 687
Purification and Properties of the Adenosine Diphosphoglucose:Glycogen Transglucosylase of *Pasteurella pseudotuberculosis*. D. N. Dietzler and Jack L. Strominger ..... 946

## Volume 113 Contents for March Number 3

### Ecology

Taxonomy of Marine Bacteria: *Beneckea parahaemolytica* and *Beneckea alginolytica*. Paul Baumann, Linda Baumann, and John L. Reichelt ..... 1144

### Morphology and Ultrastructure

Microcinematographic Studies of *Mycoplasma hominis* Cells. W. Bredt, H. H. Heunert, K. H. Höfling, and Brigitte Milthaler ..... 1223
Proton Magnetic Resonance Spectroscopy of *Klebsiella* Capsular Polysaccharides.

G. M. Bebault, Y. M. Choy, G. G. S. Dutton, N. Funnell, A. M. Stephen, and M. T. Yang ..... 1345
Cytochemical Reactions of Human Leprosy Bacilli and Mycobacteria: Ultrastructural Implications. Clark A. Fisher and Lane Barksdale ..... 1389
Fine Structure of *Cryptococcus neoformans* Grown In Vitro as Observed by Freeze-Etching. K. Takeo, I. Uesaka, K. Uehira, and M. Nishiura ..... 1442
Fine Structure of *Cryptococcus neoformans* Grown In Vivo as Observed by Freeze-Etching. K. Takeo, I. Uesaka, K. Uehira, and M. Nishiura ..... 1449
Fine Structural Changes of *Acetobacter suboxydans* During Growth in a Defined Medium. Barry L. Batzing and G. W. Claus ..... 1455
Responses of Indigenous Microorganisms to Soil Incubation as Viewed by Transmission Electron Microscopy of Cell Thin Sections. H. C. Bae and L. E. Casida, Jr. ..... 1462
A Polypeptide Bacteriophage Receptor: Modified Cell Wall Protein Subunits in Bacteriophage-Resistant Mutants of *Bacillus sphaericus* Strain P-1. Lawrence Howard and Donald J. Tipper ..... 1491

**Genetics and Molecular Biology**

Close Linkage of the Genes *serC* (for Phosphohydroxy Pyruvate Transaminase) and *serS* (for Seryl-Transfer Ribonucleic Acid Synthetase) in *Escherichia coli* K-12. S. J. Clarke, B. Low, and W. H. Konigsberg ..... 1091
Isolation and Characterization of a Regulatory Mutant of an Aminoacyl-Transfer Ribonucleic Acid Synthetase in *Escherichia coli* K-12. S. J. Clarke, B. Low, and W. Konigsberg ..... 1096
Genetic Recombination in Mycobacteria. Tohru Tokunaga, Yasuo Mizuguchi, and Kiyoko Suga ..... 1104
Relationship Between Methionyl Transfer Ribonucleic Acid Cellular Content and Synthesis of Methionine Enzymes in *Saccharomyces cerevisiae*. Y. Surdin-Kerjan, H. Cherest, and H. de Robichon-Szulmajster ..... 1156
Relation Between Survival and Deoxyribonucleic Acid Replication in Ultraviolet-Irradiated Resistant and Sensitive Strains of *Escherichia coli* B/r. J. M. Rudé and C. O. Doudney ..... 1161
Role of the Translocation Factor G in the Regulation of Ribonucleic Acid Synthesis. Elazar Rabbani and P. R. Srinivasan ..... 1177
*Salmonella typhimurium* Mutants Lacking Ribonuclease I: Effect on the Polarity of Histidine Mutants. Carmelo B. Bruni, Matthew M. Rechler, and Robert G. Martin ..... 1207
Inhibition of Transformation in Group H Streptococci by Lysogeny. C. Lowell Parsons, Jon M. Ranhand, Carmen G. Leonard, Alba E. Coloń, and Roger M. Cole ..... 1217
Repair of Single-Strand Deoxyribonucleic Acid Breaks in Ultraviolet Light-Irradiated *Haemophilus influenzae*. George J. Kantor and B. J. Barnhart ..... 1228
Postmaturational Cleavage of 23*s* Ribosomal Ribonucleic Acid and Its Metabolic Control in the Blue-Green Alga *Anacystis nidulans*. W. Ford Doolittle ..... 1256
Genetic Fine Structure of the Leucine Operon of *Escherichia coli* K-12. J. M. Somers, A. Amzallag, and R. B. Middleton ..... 1268
Macromolecular Synthesis During the Germination of *Saccharomyces cerevisiae* Spores. Paul Rousseau and Harlyn O. Halvorson ..... 1289
Evidence for an Extrakaryotic Mutation Affecting the Maintenance of the rho Factor in Yeast. A. Handwerker, R. J. Schweyen, K. Wolf, and F. Kaudewitz ..... 1307
Use of Fluorouracil-Uracil Combinations to Study Growth Accompanied by Insufficient Deoxyribonucleic Acid Synthesis in *Bacillus cereus*. Charles H. Doolittle, H. George Mandel, and Gerald A. Hahn ..... 1311
Bacterial Cell Division Regulation: Lysogenization of Conditional Cell Division *lon*⁻ Mutants of *Escherichia coli* by Bacteriophage Lambda. James R. Walker, Christine L. Ussery, and Jane Smith Allen ..... 1326
Involvement of Threonine Deaminase in Repression of the Isoleucine-Valine and Leucine Pathways in *Saccharomyces cerevisiae*. Arthur P. Bollon and P. T. Magee ..... 1333

Isolation and Characterization of Thermosensitive *Escherichia coli* Mutants Defective in Deoxyribonucleic Acid Replication. JAMES A. WECHSLER, VOLKER NÜSSLEIN, BERND OTTO, ALBRECHT KLEIN, FRIEDRICH BONHOEFFER, RICHARD HERRMANN, LIESELOTTE GLOGER, AND HEINZ SCHALLER ..... 1381
Control of Arginine Biosynthesis in *Escherichia coli*: Role of Arginyl-Transfer Ribonucleic Acid Synthetase in Repression. L. S. WILLIAMS ..... 1419
Control of Arginine Biosynthesis in *Escherichia coli*: Characterization of Arginyl-Transfer Ribonucleic Acid Synthetase Mutants. A. L. WILLIAMS AND L. S. WILLIAMS ..... 1433
Serological Study of Bacterial Flagellar Hooks. HIROAKI KAGAWA, SHO ASAKURA, AND TETSUO IINO ..... 1474
Mutants of *Bacillus subtilis* Temperature Sensitive in the Outgrowth Phase of Spore Germination. A. GALIZZI, F. GORRINI, A. ROLLIER, AND M. POLSINELLI ..... 1482
Transfection of Group H Streptococci. C. LOWELL PARSONS AND ROGER M. COLE ..... 1505
Amino Terminal Sequence of the Tryptophan Synthetase Alpha Chain of *Serratia marcescens*. SHOEI-LUNG LI, GABRIEL R. DRAPEAU, AND CHARLES YANOFSKY ..... 1507
Increased Viability of a Strain of *Neurospora crassa* After Treatment with Ultraviolet Radiation or Other Agents. PAMELA W. FELDHOFF, JEROME L. SULLIVAN, AND A. GIB DEBUSK ..... 1509
Fate of Transforming Deoxyribonucleic Acid After Uptake by Competent *Bacillus subtilis*: Nonrequirement of Deoxyribonucleic Acid Replication for Uptake and Integration of Transforming Deoxyribonucleic Acid. D. DUBNAU AND C. CIRIGLIANO ..... 1512

## Physiology and Metabolism

Metabolism of Phenol and Cresols by Mutants of *Pseudomonas putida*. R. C. BAYLY AND G. J. WIGMORE ..... 1112
Characterization of the Lipids of Six Strains of *Bacteroides ruminicola*. JOSEPH E. KUNSMAN ..... 1121
Distinct Kynureninase and Hydroxykynureninase Activities in Microorganisms: Occurrence and Properties of a Single Physiologically Discrete Enzyme in Yeast. A. S. SHETTY AND F. H. GAERTNER ..... 1127
Role of Glutathione in the Morphogenesis of the Bacterial Spore Coat. H. M. CHENG, A. I. ARONSON, AND S. C. HOLT ..... 1134
Effect of Weak Acids on Amino Acid Transport by *Penicillium chrysogenum*: Evidence for a Proton or Charge Gradient as the Driving Force. DOUGLAS R. HUNTER AND IRWIN H. SEGEL ..... 1184
Action of Yeast Killer Factor: a Resistant Mutant with Sensitive Spheroplasts. HOWARD BUSSEY, DOREEN SHERMAN, AND J. M. SOMERS ..... 1193
Electric Conductivity and Internal Osmolality of Intact Bacterial Cells. ROBERT E. MARQUIS AND EDWIN L. CARSTENSEN ..... 1198
Polynucleotide Phosphorylase Has a Role in Growth of *Escherichia coli*. RANGACHAR V. KRISHNA AND DAVID APIRION ..... 1235
Purification and Identification of the Fruiting-Inducing Substances in *Coprinus macrorhizus*. ISAO UNO AND TATSUO ISHIKAWA ..... 1240
Metabolism of Adenosine 3′,5′-Cyclic Monophosphate and Induction of Fruiting in *Coprinus macrorhizus*. ISAO UNO AND TATSUO ISHIKAWA ..... 1249
Resolution of the Nitrate Reductase Complex from the Membrane of *Escherichia coli*. E. I. VILLARREAL-MOGUEL, V. IBARRA, J. RUÍZ-HERRERA, AND C. GITLER ..... 1264
Sequential Metabolic Events During Encystment of *Azotobacter vinelandii*. V. M. HITCHINS AND H. L. SADOFF ..... 1273
Respiration of *Bdellovibrio bacteriovorus* Strain 109J and Its Energy Substrates for Intraperiplasmic Growth. ROBERT B. HESPELL, REINHARDT A. ROSSON, MICHAEL F. THOMASHOW, AND SYDNEY C. RITTENBERG ..... 1280
Synthesis of Ribosomal Ribonucleic Acid During Sporulation of *Bacillus subtilis*. C. BONAMY, L. HIRSCHBEIN, AND J. SZULMAJSTER ..... 1296

Histidine Uptake in Mutant Strains of *Neurospora crassa* Via the General Transport System for Amino Acids. C. W. MAGILL, S. O. NELSON, S. M. D'AMBROSIO, AND G. I. GLOVER ..... 1320
5-Fluoropyrimidine-Resistant Mutants of Pneumococcus. BARRY BEAN AND ALEXANDER TOMASZ ..... 1348
Selective Utilization of Pyrimidine Deoxyribonucleic Acid Synthesis in Pneumococcus. BARRY BEAN AND ALEXANDER TOMASZ ..... 1356
Manganese Transport in *Bacillus subtilis* W23 During Growth and Sporulation. ERIC EISENSTADT, SUSAN FISHER, CHI-LUI DER, AND SIMON SILVER ..... 1363
Regulation of Manganese Accumulation and Exchange in *Bacillus subtilis* W23. SUSAN FISHER, LARRY BUXBAUM, KATHLEEN TOTH, ERIC EISENSTADT, AND SIMON SILVER ..... 1373
Immunologically Cross-Reacting Proteins in Cell Walls of Many Bacteria. HARRY G. RITTENHOUSE, J. BARRY RODDA, AND BRUCE A. MCFADDEN ..... 1400
Requirement of Adenosine-3′,5′-Cyclic Monophosphate for L-Arabinose Isomerase Synthesis in *Escherichia coli*. TERUKO NAKAZAWA AND TAKESHI YOKOTA ..... 1412

## Enzymology

Characterization of Esterases Produced by a Ruminal Bacterium Identified as *Butyrivibrio fibrisolvens*. WAYNE W. LANZ AND PHLETUS P. WILLIAMS ..... 1170
Anthranilate Hydroxylase from *Aspergillus niger*: Evidence for the Participation of Iron in the Double Hydroxylation Reaction. R. PREMA KUMAR, N. S. SREELEELA, P. V. SUBBA RAO, AND C. S. VAIDYANATHAN ..... 1213
Regulation of D-Xylose and D-Arabitol Catabolism by *Aerobacter aerogenes*. BAMBI L. WILSON AND R. P. MORTLOCK ..... 1404

# YOU ARE INVITED

to attend

## THE 73RD ANNUAL MEETING

AMERICAN SOCIETY FOR MICROBIOLOGY

***Over 200 Scientific Sessions***

Symposia
Special Lectures
Seminars
Round Tables
Workshops
Contributed Papers

***Over 250 Exhibits***

Technical—Scientific—Educational

**6–11 May 1973**
**Miami Beach, Florida**

***Registration Open to All Interested Persons***

*For Additional Information:*
The Executive Secretary, ASM,
1913 Eye St., NW, Washington, DC 20006

# AUTHOR INDEX

## VOLUME 113


Adair, Frank W., 409
Akagi, James M., 252, 322
Allen, Jane Smith, 1326
Allen, Mary M., 403
Amstein, Charles F., 38
Amzallag, A., 1268
Anderson, Janet A., 114
Ankel, Helmut, 627
Apirion, David, 1235
Araki, Yoshio, 592
Armstrong, John B., 76
Aronson, A. I., 313, 1134
Arthur, Larry O., 619
Asakura, Sho, 1474
Atherly, Alan G., 178
Azuma, Ichiro, 515

Bacon, Charles W., 1061
Bae, H. C., 1462
Bahramian, M. B., 504
Balbinder, Elias, 183
Barash, H., 51
Barbour, Stephen D., 114
Barksdale, Lane, 1389
Barnhart, B. J., 1228
Baron, L. S., 763
Batzing, Barry L., 1455
Baumann, Linda, 1144
Baumann, Paul, 1144
Bayly, R. C., 1112
Bean, Barry, 1348, 1356
Bebault, G. M., 1345
Beckett, A., 373, 1054
Bennett, Robert L., 529
Bernstein, I. A., 901
Bhagwat, A. S., 572
Bignami, Margherita, 500
Billen, Daniel, 88
Bilsky, Anna Z., 76
Birdsell, D. C., 198
Birnbaum, Jerome, 218
Bliesmer, Barry O., 526
Bollon, Arthur P., 1333
Bonamy, C., 1296
Bonhoeffer, Friedrich, 1381
Boulter, James R., 687
Boyer, Herbert W., 724
Boylen, Charles W., 33
Bradley, S. G., 645
Breakefield, Xandra O., 985
Bredt, W., 1223
Bromberg, Fred G., 512
Buklad, Naomi E., 167
Bulla, L. A., Jr., 524
Bruni, Carmelo B., 1207
Burton, Earl G., 519
Bussey, Howard, 1193
Button, D. K., 599
Buxbaum, Larry, 1373

Calhoun, David H., 241
Carere, Angelo, 500
Carstensen, Edwin L., 1198
Casida, L. E., Jr., 1462
Chan, E. C. S., 394
Chan, May, 322
Chapman, Peter J., 521, 922, 1064
Charles, H. P., 122
Chatterjee, Anadi N., 486
Cheng, H. M., 1134
Cherest, H., 1156
Choy, Y. M., 1345
Cirigliano, C., 1512
Cirillo, Vincent P., 212
Clarke, S. J., 1091, 1096
Claus, G. W., 1455
Clowes, R. C., 1026
Cole, Roger M., 1505, 1217
Collinsworth, William L., 922
Coloń, Alba E., 1217
Colwell, Rita R., 24
Costerton, J. W., 445
Cox, Roger, 122
Cummings, Donald J., 711

Dagley, Stanley, 521, 922, 1064
D'Ambrosio, S. M., 1320
Dankberg, Frances, 711
Datta, Archana, 763
Davies, Roland, 133
DeBusk, A. Gib, 1509
Decker, G. L., 433
Deibel, R. H., 278
Dennis, D. Adele, 521
Der, Chi-Lui, 1363
de Robichon-Szulmajster, H., 1156
Dietzler, D. N., 946
Doolittle, Charles H., 1311
Doolittle, W. Ford, 1256
Doudney, C. O., 1161
Doyle, R. J., 198, 612
Drake, J. F., 834
Drapeau, Gabriel R., 1507
Druck, Karnina, 51
Dubnau, D., 1512
Duncan, Charles L., 932
Dunker, Sally S., 599
Dutton, G. G. S., 1345
Dworkin, Martin 768

Eagon, R. G., 417
Eisenstadt, Eric, 1363, 1373
Elbein, Alan D., 863
Elliot, Donna, 704
Evans, Elisabeth L., 403
Ewins, Anna, 71

Fass, Robert J., 1049
Feldhoff, Pamela W., 1509
Fiedler, Franz, 8
Fiil, N., 697
Fisher, Clark A., 1389
Fisher, Susan, 1363, 1373
Fisher, W. D., 999, 1006
Forge, A., 445
Forsberg, C. W., 969
Frank, Hilmer A., 1058
Fraser, Dean, 963
Fredrickson, A. G., 834
Freese, Elisabeth B., 1034
Freese, Ernst, 1034
Friesen, J. D., 697
Fujita, Yasutaro, 558
Fukui, Sakuzo, 652, 665
Funnell, N., 1345

Gaertner, F. H., 1127
Galizzi, A., 1482
Geftic, Sam G., 409
Gelzer, Justus, 409
Germershausen, John I., 847
Gibbens, Janet W., 365
Gielow, William O., 687
Gilleland, H. E., Jr., 417
Gilpin, Richard W., 486
Gitler, C., 1264
Gloger, Lieselotte, 1381
Glover, G. I., 1320
Godson, G. Nigel, 813
Gold, Michael H., 856
Golub, E. S., 313
Gomersall, M., 394
Gorrini, F., 1482
Grecz, Nicholas, 1058
Greenawalt, J. W., 433
Greenspan, Michael D., 847
Grove, Stanley N., 468

Hadden, Charles T., 88
Hahn, Gerald A., 1311
Halpern, Y. S., 51
Halvorson, Harlyn O., 1289
Hanawalt, P. C., 233
Handwerker, A., 1307
Hartman, Paul A., 38, 526
Hayano, Koichi, 652
Hayashi, Hideyuki, 592
Hempfling, Walter P., 914
Herrmann, Richard, 1381

Hespell, Robert B., 1280
Heunert, H. H., 1223
Heymann, Hans, 409
Higashi, Noboru, 357
Himes, Richard H., 252, 322
Hirschbein, L., 1296
Hirshfield, Irvin N., 167
Hitchins, V. M., 1273
Hoare, D. S., 937
Hoch, James A., 1076
Hoffman, Hans-Peter, 409
Höfling, K. H., 1223
Holmes, W. M., 224
Holt, S. C., 433, 1134
Horn, Diane, 313
Houston, L. L., 82
Howard, Lawrence, 1491
Huang, T. C., 884
Hunter, Douglas R., 1184

Ibarra, V., 1264
Iino, Tetsuo, 1474
Ikeya, Yoshiko, 704
Illingworth, R. F., 373, 1054
Ingram, L. O., 999, 1006
Inouye, Masayori, 304
Inselburg, Joseph W., 1084
Irwin, Carol C., 252
Isaacson, Richard E., 452
Ishikawa, Tatsuo, 1240, 1255
Ito, Eiji, 592
Itoh, Tonetaro, 515

Jensen, Roy A., 224, 241
Jordan, D. C., 387
Jorstad, Caroline M., 271
Jost, J. L., 834
Juengst, Fredrick W., Jr., 786

Kadner, Robert J., 895
Kagawa, Hiroaki, 1474
Kahane, Itzhak, 666
Kakimoto, Sei-Ichiro, 727
Kalsow, Carolyn M., 612
Kandler, Otto, 8
Kane, J. F., 224
Kaneko, Tatsuo, 24
Kaneshiro, Tsuneo, 619
Kantor, George J., 1228
Kaplan, J. G., 680
Kaplan, Louis, 218
Kaplan, S., 1081
Kaudewitz, F., 1307
Kelln, Rod A., 510
Kent, Claudia, 874
Kerr, K. Ann, 445
Kita, Hiroshi, 672
Klein, Albrecht, 1381
Knox, K. W., 365
Koffler, Henry, 295
Kohsaka, Kenji, 515
Komano, Tohru, 558
Konigsberg, W. H., 1091, 1096
Konisky, Jordan, 452
Kottel, R. H., 341
Krag, Sharon S., 874
Kreger-Van Rij, N. J. W., 350
Krishna, Rangachar V., 1235
Krulwich, Terry A., 907
Kumar, R. Prema, 1213
Kunsman, Joseph E., 1121
Kunugita, Kiyohiko, 42
Kushner, D. J., 680

Lampen, J. O., 1073
Landman, Otto E., 985
Lanz, Wayne W., 1170
Lark, Karl G., 1066
Lennarz, W. J., 874
Leonard, Carmen G., 1217
Levine, Lawrence, 18
Lewis, Elaine, 1070
Lindberg, Martin, 576
Li, Shoei-Lung, 1507
Little, J. G., 233
Loperfido, Bonnie, 841
Low, Brooks, 798, 1091, 1096
Lugtenberg, E. J. J., 96

McCord, Joseph M., 524
McFadden, Bruce A., 1400
McFall, Elizabeth, 781
McGroarty, Estelle J., 295
MacKenzie, C. R., 387
MacLeod, Robert A., 329
Macrina, Francis L., 183
Magee, P. T., 1333
Magill, C. W., 1320
Mahadevan, P. R., 572
Maizel, J. V., Jr., 478
Malamy, Michael H., 529
Mandel, H. George, 1311
Mandy, W. J., 937
Marquis, Robert E., 1198
Martin, Robert G., 1207
Matsuhashi, Michio, 42
Matsumoto, Akira, 357
Metcalf, Robert H., 278
Metzenberg, Robert L., 519
Meynell, Elinor, 71, 502
Middleton, R. B., 504, 1268
Milcarek, Christine, 1086
Milliken, Christine E., 1026
Milthaler, Brigitte, 1223
Mitchell, Mike, 863
Mitzel, Duane L., 856
Miyairi, Sachio, 658
Mizuguchi, Yasuo, 1104
Mori, Tatsuo, 515
Morris, David R., 271
Morse, M. L., 599
Mortenson, L. E., 884
Mortlock, R. P., 1404
Muhsam-Peled, Ofra, 586
Nakazawa, Teruko, 1412
Ne'eman, Zvi, 666
Nelson, S. O., 1320
Nickerson, Kenneth W., 619
Nikaido, Hiroshi, 672
Nishiura, M., 1442, 1449
Norberg, P., 680
Norlin, Margareta, 1
Nüsslein, Volker, 1381

O'Day, Danton H., 192
Oh, Yong K., 1034
Olden, Kenneth, 914
Olsen, Ronald H., 772
Oshima, Yasuji, 727
Otto, Bernd, 1381
Oujezdsky, Karen B., 468

Parker, Charlotte D., 763
Parsons, C. Lowell, 1505, 1217
Patel, R. N., 937
Paul, Ara G., 1061
Philipson, Lennart, 576
Pierson, Duane L., 241
Polsinelli, M., 1482
Poyton, Robert O., 203

Rabbani, Elazar, 1177
Raj, H. D., 341
Randazzo, Rosalba, 500
Ranhand, Jon M., 1217
Razin, Shmuel, 212, 565, 586, 666
Rechler, Matthew M., 1207
Reeves, Peter, 58
Reichelt, John L., 1144
Remeza, Virgilija, 739, 754
Ridell, Malin, 1
Rittenberg, Sydney C., 1280
Rittenhouse, Harry G., 1400
Ritter, Clare Schuld, 1064
Rodda, J. Barry, 1400
Rogers, H. J., 329, 969
Rollier, A., 1482
Rose, A. H., 373, 1054
Roseman, Saul, 512
Rosson, Reinhardt A., 1280
Roth, I. L., 417
Rottem, Shlomo, 565, 586
Rousseau, Paul, 1289
Rubenstein, Peter A., 291
Rudé, J. M., 1161
Rudner, Rivka, 739, 754
Ruíz-Herrera, J., 1264

Sadoff, H. L., 841, 1273
Saier, Milton H., Jr., 512
Santa Maria, J., 1078
Schaller, Heinz, 1381
Schleifer, Karlheinz, 8
Schultz, John C., 627
Schweyen, R. J., 1307
Seale, Thomas, 1015
Segel, Irwin H., 856, 1184
Sermonti, Giuseppe, 500
Setlow, Peter, 18
Shapiro, Lucille, 478

Sherman, Doreen, 1193
Shetty, A. S., 1127
Shipley, Patricia, 772
Shively, J. M., 433
Siegel, Eli C., 145, 161
Silva, M. T., 953
Silverman, M., 105
Silver, Simon, 1363, 1373
Simon, M., 105
Sinskey, Anthony J., 133
Sjöström, Jan-Eric, 576
Skurray, Ronald A., 58
Slater, Martin L., 263
Slocum, Harvey, 724
Smiley, K. L., Jr., 224
Smith, R. W., 295
Sobel, Mark E., 907
Somers, J. M., 1193, 1268
Sousa, J. C. F., 953
Sparling, P. Frederick, 704
Sreeleela, N. S., 1213
Srinivasan, P. R., 1177
Steinberg, William, 1076
Stephen, A. M., 1345
Stinnett, J. D., 417
Strominger, Jack L., 287, 291, 946
Subba Rao, P. V., 1213
Suga, Kiyoko, 1104
Sullivan, Jerome L., 1509
Summers, Anne O., 1070
Sundaram, T. K., 549
Surdin-Kerjan, Y., 1156
Sussman, Alfred S., 1061
Szaniszlo, Paul J., 468
Szulmajster, J., 1296
Tafler, Susan W., 18
Takagaki, Yohtaroh, 42
Takeo, K., 1442, 1449
Tamura, Akira, 357
Tanaka, Yoshinori, 515
Tang, Terry, 1058
Tanooka, Hiroshi, 558
Thomashow, Michael F., 1280
Thurman, Paul, 329
Timmis, Kenneth, 508
Tipper, Donald J., 1491
Tkacz, J. S., 1073
Toh-e, Akio, 727
Tokunaga, Tohru, 1104
Tomasz, Alexander, 1348, 1356
Toth, Kathleen, 1373
Tsubouchi, Yukio, 652
Tsuchiya, H. M., 834
Tyrrell, E. A., 1046

Ueda, Yoshinami, 727
Uehira, K., 1442, 1449
Uesaka, I., 1442, 1449
Uno, Isao, 1240, 1249
Ussery, Christine L., 1326

Vaidyanathan, C. S., 1213
Vail, W. J., 387
van Schijndel-van Dam, Arna, 96
Veenhuis, M., 350
Vidal, D., 1078
Villarreal-Moguel, E. I., 1264
Virmani, Y. P., 322
Vold, Barbara S., 825
Vovis, Gerald F., 718

Walker, James R., 1326
Ward, J. B., 969
Warren, R. A. J., 510
Warth, Alan D., 291
Wechsler, James A., 1381
Weigand, R. A., 433
Weiss, Bernard, 1086
Weiss, Richard L., 963
West, David J., 637
White, Raymond F., 218
Wicken, A. J., 365
Wickus, Gary G., 287, 291
Wigmore, G. J., 1112
Williams, A. L., 1433
Williams, L. S., 891, 1419, 1432
Williams, Phletus P., 1170
Willsky, Gail R., 529
Wilson, Bambi L., 1404
Wilson, Gary A., 540
Winkler, Herbert H., 895
Winkler, Ulrich, 558
Wohlhieter, J. A., 763
Wolf, K., 1307
Wolfe, R. S., 461
Woodward, Dow O., 637
Wyrick, P. B., 969

Yamamura, Yuichi, 515
Yang, M. T., 1345
Yanofsky, Charles, 1507
Yasbin, Ronald E., 540
Yee, Mei-Lan, 304
Yem, D. W., 891
Yokota, Takeshi, 1412
Young, Frank E., 486, 540
Youngs, David A., 901
Yousten, Allan A., 524

Zeikus, J. G., 461
Zumft, W. G., 884
Zyk, B., 394

# SUBJECT INDEX

## VOLUME 113


*Acetobacter suboxydans*
fine structural changes, 1455
*Acholeplasma laidlawii*
acyl carrier protein, 586
membrane lipids, 565
*Acholeplasma* sp.
membrane $Mg^{2+}$ content, 666
Acid phosphatase mutant
*S. cerevisiae*, 727
Acyl carrier proteins
*Acholeplasma laidlawii*, 586
fatty acid synthesis, 586
mycoplasmas, 586
Adenosine 3′,5′-cyclic monophosphate
*E. coli*, 781
fruiting body formation, 1240, 1249
D-serine deaminase synthesis, 781
Adenosine 3′,5′-cyclic phosphate
*E. coli* L-arabinose isomerase, 1412
Adenosine diphosphoglucose:glycogen transglucosylase
*P. pseudotuberculosis*, 946
Adenosine-3′-monophosphate
fruiting body formation, 1240
Adenosine triphosphate-dependent deoxyribonuclease
*D. pneumoniae*, 718
*Aerobacter aerogenes*
flagellar hooks, 1474
D-xylose and D-arabitol catabolism, 1404
*Agmenellum quadruplicatum*
division mutant, 999, 1006
division regulation, 1006
*Agrobacterium tumefaciens*
glucose-1-phosphate-negative mutant, 658
3-ketoglucose reductase, 652
pantothenate accumulation, 619
Alanine
effect on lysyl-tRNA ligase activity, 167
D-Alanine:D-alanine ligase
*E. coli* K-12 mutant, 96
Alanine racemase
*E. coli* K-12 mutant, 96
Aldol fission
*P. putida* catechol, 922
Alkaline phosphatase regulation
*E. coli* genes *phoS* and *phoT*, 529
Amino acid sequence
*S. marcescens* $\alpha$ chain, 1507
threonine-containing mureins, 8
Amino acid transport
*Penicillium*, 1184
proton gradient as driving force, 1184
Aminoacyl-transfer ribonucleic acid
*E. coli* regulatory mutant, 1096
Aminoacyl-transfer ribonucleic acid synthetase
gene conservation in *Bacillus*, 1076
Amylase
heat stability in bacilli, 526
*Anacystis nidulans*
cleavage of 23*s* rRNA, 1256
phycobilisomes, 403
Anastomosis
cell contacts, 350
*Anthranilate hydroxylase*
*Aspergillus niger*, 1213
Anthranilate synthase aggregate
regulation by hysteresis, 224
D-Arabinose isomerase
*E. coli*, 687
L-Arabinose isomerase
*E. coli*, 1412
D-Arabitol catabolism
*A. aerogenes*, 1404
Arginine biosynthesis repression
arginyl-tRNA, 1419
*E. coli*, 1419
Arginyl-transfer ribonucleic acid
*E. coli* arginine biosynthesis, 1419, 1433
Arginyl-transfer ribonucleic acid synthetase
*E. coli*, 891
*E. coli* arginine biosynthesis, 1433
Aromatic amino acids
reversal of growth inhibition, 504
Aromatic compounds
degradation, 922
*P. putida*, 922
*Arthrobacter*
threonine-containing mureins, 8
*Arthrobacter crystallopoietes*
desiccation, 33
*Arthrobacter globiformis*
biotin deficiency, 394
*Arthrobacter pyridinolis*
D-fructose metabolism, 907
Aryl sulfatase
*N. crassa* ascospores, 519
Ascospores
*N. crassa*, 519
Ascospore wall development
*S. cerevisiae*, 1054
Ascus formation
*S. cerevisiae* fine structure, 373
lipid composition, 373
Aspartate transcarbamylase
*H. cutirubrum*, 680
kinetics and regulation, 680
*Aspergillus aculeatus*
nigeran accumulation, 856
*Aspergillus niger*
anthranilate hydroxylase, 1213
double hydroxylation, 1213
Autolysis
*L. monocytogenes*, 1046

*Azotobacter vinelandii*
cyst germination, 841
encystment, 1273
food web interaction, 834
β-hydroxybutyrate, 1273
macromolecular synthesis, 841
nitrogen fixation, 841

*Bacillus cereus*
fluorouracil-uracil combinations for growth studies, 1311
glucosamine (*N*-unsubstituted) in cell walls, 592
glutathione and the spore coat, 1134
photoprotection, 1058
spore coat morphogenesis, 1134
*Bacillus coagulans*
amylase heat stability, 526
*Bacillus licheniformis*
phosphate limitation, 969
phosphoglucomutase-deficient mutants, 969
transport activity of cells, membranes, and mesosomes, 329
*Bacillus megaterium*
glucosamine (*N*-unsubstituted) in cell walls, 592
*Bacillus popilliae*
superoxide dismutase, 524
*Bacillus sphaericus*
polypeptide phage receptor, 1134
*Bacillus stearothermophilus*
amylase heat stability, 526
pyruvate carboxylase, 549
*Bacillus subtilis*
aminoacyl-tRNA synthetase genes, 1076
anthranilate synthase aggregate regulation, 224
Con A-cell wall interactions, 198
defective membranes, 874
division mutant, 985
DNA strand biological properties, 739
DNA synthesis in spores, 558
DNA transformation of hybrids, 754
EX complex, 224
germinating spores, 558
glucosamine (*N*-unsubstituted) in cell walls, 592
L-α-glycerophosphate accumulation, 1034
hysteresis, 224
L-form characterization, 486
manganese accumulation, 1373
manganese transport, 1363
rRNA synthesis during sporulation, 1296
septation initiation, 985
spore coat protein analysis, 313
spore germination outgrowth phase, 1482
transformation and transfection, 540
transformation using 6-(*p*-hydroxyphenylazo)-uracil, 1512
tRNA in spores and exponential cells, 825
UV repair, 88
*Bacillus subtilis* sportulation
uracil incorporation, 1296
*Bacteroides ruminicola*
lipid characterization, 1121
*Bdellovibrio bacteriovorus*
respiration and intraperiplasmic growth, 1289
*Beneckea alginolytica*
taxonomy, 1144
*Beneckea parahaemolytica*
taxonomy, 1144
Benzalkonium chloride
*P. aeruginosa* growth, 409
Betaine-homocysteine transmethylase
*P. denitrificans*, 218
Biotin deficiency
*A. globiformis*, 394
nonreplacement of the vitamin, 394
Biotin requirements
*B. stearothermophilus*, 549
*Brevibacterium*
threonine-containing mureins, 8
*Butyrivibrio fibrisolvens*
esterase characterization, 1170

Capsular polysaccharides
*Klebsiella*, 1345
Carbenicillin resistance
*P. aeruginosa* R factor, 772
Carbohydrate metabolism
*Microcyclus* sp., 341
Catechol
catabolism in *P. putida*, 922
Catenated colicin factor E1
*E. coli*, 1084
*Caulobacter crescentus*
flagella, 478
Cell transport activity
*B. licheniformis*, 329
*Cellulomonas*
threonine-containing mureins, 8
Cell wall
double-track layer, 445
glucosamine (*N*-unsubstituted), 592
*M. lepraemurium* Hawaii, 515
Cell wall component reaggregation
ultrastructural demonstration, 417
Channel-shuttle mechanism
*P. aeruginosa*, 241
regulation of phenylalanine and tyrosine synthesis, 241
χ phage
*E. coli* flagellar mutants, 105
*Chlamydia psittaci*
polymyxin B sulfate treatment, 357
Chloramphenicol
*E. coli* DNA replication, 1066
Clofibrate
*S. cerevisiae* growth and lipid synthesis, 847
Clostridia
ribosomes, polyribosomes, and DNA, 252
*Clostridium pasteurianum*
molybdoferredoxin complex, 884
*Clostridium perfringens*
enterotoxin formation, 932
sporulation, 932
Colicin I-producing cells
electron microscopy, 452
Colicin K
action on $^{32}P_i$, 42
*E. coli* $^{32}P_i$ uptake, 42

Complement fixation
DNA polymerases serological relatedness, 18
Comutation
*S. coelicolor*, 500
Concanavalin A
*B. subtilis* cell walls, 198
phage $\phi$25 adsorption, 198
Concanavalin A-cell wall interactions
*B. subtilis*, 198
Conductivity
*S. faecalis* and *M. lysodeikticus*, 1198
*Coprinus macrorhizus*
fruiting-inducing substances, 1240, 1249
Coryneform bacteria
threonine-containing mureins, 8
Covalently closed circular deoxyribonucleic acid
isolation from exocellular nuclease mutants, 508
Cresol
metabolism by *P. putida*, 1112
Cross-reacting proteins
cell wall, 1400
*Cryptococcus laurentii*
glycogen biosynthesis, 627
starch biosynthesis, 627
*Cryptococcus neoformans*
fine structure, 1442, 1449
Cyst germination
*A. vinelandii*, 841

Deoxyribonucleic acid
*B. subtilis* spores, 558
chromatographically fractionated complementary strands, 739, 754
clostridia, 252
inhibition of synthesis by 5-fluorouracil, 1311
initiation and termination of replication, 1066
polyamine limitation, 271
repair in *H. influenzae*, 1228
replication inhibition, 1066
reversible inhibition of synthesis, 263
*S. typhimurium* host specificity, 174
transfer factor $\Delta$, 1026
transformation and UV repair, 88
X-ray-induced degradation, 901
Deoxyribonucleic acid binding
effect of lysogeny, 1217
Deoxyribonucleic acid-mediated transfection,
*B. subtilis*, 540
Deoxyribonucleic acid-mediated transformation
*B. subtilis*, 540
Deoxyribonucleic acid-membrane attachment
thymineless death in *E. coli*, 711
Deoxyribonucleic acid polymerases
*E. coli* B, 18
*mutU4 polA* inviability, 161
radiation-resistant *S. typhimurium* mutant, 133
serological relatedness, 18
Deoxyribonucleic acid reassociation
relationships among mycobacteria and nocardiae, 645
Deoxyribonucleic acid repair systems
*E. coli* K-12, 114
Deoxyribonucleic acid replication
*E. coli* thermosensitive mutant, 1373, 1381
Deoxyribonucleic acid replication
irradiated *E. coli*, 1161
Deoxyribonucleic acid synthesis
pyrimidine deoxyribonucleoside utilization, 1356
Desiccation
*A. crystallopoietes* survival, 33
*Dictyostelium discoideum*
self-inhibitor from spores, 1061
Dipicolinate
photoprotection, 1058
*Diplococcus pneumoniae*
ATP-dependent DNase, 718
*Diplococcus pneumoniae*
5-fluoropyrimidine-resistant mutants, 1348
*Diplococcus pneumoniae*
transforming DNA, 718
Divalent cations
mycoplasma membranes, 666
Division mutant
*Agmenellum quadruplicatum*, 999, 1006
Division mutant
*B. subtilis*, 985
Double hydroxylation
iron participation, 1213
Drug resistance factor
*P. aeruginosa*, 772

Electrolytes
*S. faecalis* and *M. lysodeikticus*, 1198
Elementary body
polymixin B sulfate, 357
Electron spin resonance study
facultative thermophilic bacillus membrane, 322
Elongation factor G mutation
*E. coli* relaxed phenotype, 178
Encystment
*A. vinelandii*, 1273
*Endomycopsis javanensis*
anastomosing hyphae, 350
Enterococci
differentiation by GC, 38
fatty acid compositions, 38
Enterotoxin formation
*C. perfringens*, 932
Envelope proteins
separation in *E. coli*, 304
*Erysipelothrix*
threonine-containing mureins, 8
*Escherichia coli*
D-alanine:D-alanine ligase, 96
alkaline phosphatase regulation, 529
aminoacyl-tRNA synthetase regulatory mutant, 1096
D-arabinose isomerase, 687
L-arabinose isomerase synthesis, 1412
arginine biosynthesis, 1419, 1433
arginyl-tRNA synthetase, 891, 1433
catenated Col E1 DNA, 1084
colicin I-producing cells, 452
colicin K, 42
DNA degradation, 901
DNA-membrane attachment, 711
DNA polymerase I, 18
DNA repair systems, 114

DNA replication inhibition, 1066
envelop protein homogeneity, 304
exonuclease V, 901
extra membranes, 433
F*lac*S plasmid, 183
flagellar hooks, 1474
flagellar mutants, 105
food web interaction, 834
L-fucose-induced, 687
G factor, 1177
glutamate transport, 51
guanosine tetraphosphate accumulation, 697
hexose phosphate transport mutants, 895
kasugamycin resistance, 704
lambda lysogenization, 1326
lethal zygosis, 58
leucine operon fine structure, 1268
linkage of *serC* and *serS*, 1091
lysyl-tRNA ligase activity, 167
mapping mutations, 798
mapping mutations affecting exonuclease III, 1086
membrane mutants, 813
membrane radiosuicide selection, 813
membrane synthesis, 813
mitomycin C-induced strains, 452
modification of radiation response, 1161
nitrate reductase complex, 1264
nucleic acid regulation, 271
$P_i$ transport, 529
$^{32}P_i$ uptake, 42
phosphohydroxy pyruvate transaminase, 1091
pigment P-503, 914
polyamine limitation, 271
polynucleotide phosphorylase, 1235
porphyrin-accumulating mutants, 122
protein synthesis during thymineless death, 711
protein synthesis regulation, 271
*recB-recC* nuclease, 901
RNA metabolism, 1235
RNase I-deficient mutants, 1081
RNA synthesis regulation, 697, 1177
screening procedure for mutants, 1081
seryl-tRNA synthetase, 1091
temperature-sensitive mutants, 813
temperature-sensitive relaxed phenotype, 178
temperature sensitivity, 76
tetrahydroporphyrin, 913
thermosensitive mutant defective in DNA replication, 1373, 1581
thymineless death, 711
thymine starvation, 114
UV-sensitive mutator, 145
UV survival and DNA replication, 1161
volatilization of mercuric chloride, 1070
X-ray-induced DNA degradation, 901

Esterases
*B. fibrisolvens* produced, 1170

Ethylenediaminetetraacetate-extractable cell wall component
*P. aeruginosa*, 417

Exclusion
sex pili, 71

EX complex
*B. subtilis*, 224

Exocellular nuclease mutants
covalently closed circular DNA, 508

Exonuclease III
*E. coli*, 1086
mapping mutations, 1086

Exonuclease V
*E. coli*, 901
X-ray-induced DNA degradation, 901

Extrakaryotic mutation
rho factor in yeast, 1307

Facultative thermophilic bacillus
membrane spin-labeling study, 322

Fatty acids
acyl carrier protein, 586
enterococci differentiation, 38

Fatty acid biosynthesis
pantothenate accumulation, 619

F element
mapping flagellar defects, 105

Fertility factor P
*V. cholerae*, 863

Filamentation
*B. subtilis* mutant, 985

F*lac*S plasmid
associated functions in *E. coli*, 183

Flagella
*C. crescentus*, 478
temperature regulation of flagellar morphogenesis, 295

Flagellar hook
*Salmonella* sp., 1474
serological study, 1474

Flagellar morphogenesis
*P. vulgaris*, 295
regulation by temperature, 295

Flagellar mutations
genetic analysis, 105

Flagellin
temperature regulation of flagellar morphogenesis, 295

Flagellotropic phage $\chi$
*E. coli* flagellar mutant, 105

Flor formation
*Saccharomyces* sp., 1078

Fluoropyrimidine bases
resistant mutants of *D. pneumoniae*, 1348

Fluorouracil-uracil combinations
growth inhibition of *B. cereus*, 1311

Food poisoning
*V. parahaemolyticus* ecology, 24

Food web
chemostat culture, 834

Formate dehydrogenase
*E. coli* membrane, 1264

Freeze-etching
double-track layer from cell wall, 445
*P. aeruginosa*, 417
*R. meliloti*, 387

Freeze-fracturing
*E. coli* O111a extra membranes, 433

Fructose
effect on lysyl-tRNA ligase activity, 167
D-Fructose metabolism
*A. pyridinolis*, 907
Fruiting-inducing substances
*Coprinus macrorhizus*, 1240, 1249
L-Fucose
*E. coli* D-arabinose isomerase, 68

Galactose permease mutant
*S. typhimurium*, 512
Gas chromatography
enterococci differentiation, 38
Gene action
*N. crassa*, 572
General transport system
histidine uptake, 1320
Gluconeogenesis
*A. vinelandii* encystment, 1273
α-Methyl-D-glucopyranoside uptake
phosphoenolpyruvate-dependent phosphotransferase system, 212
Glucosamine residues
lysozyme resistance, 592
Glucose-1-phosphate metabolism
loci of transport and enzyme systems, 658
Glucose-1-phosphate-negative mutant
*A. tumefaciens*, 658
Glutamate
transport in *E. coli*, 51
Glutathione
*B. cereus* spore coat, 1134
L-α-Glycerophosphate
*B. sublilis* septation and sporulation, 1034
Glycogen biosynthesis
*C. laurentii*, 627
Glycogen synthetase
*M. smegmatis*, 863
Glyoxylate shunt
*A. vinelandii* encystment, 1273
Gram-negative bacteria
fixation techniques, 953
ultrastructure, 953
Guanosine tetraphosphate
accumulation in *E. coli*, 697

*Haemophilus influenzae*
DNA dark repair, 1228
UV repair, 1228
*Halobacterium cutirubrum*
aspartate transcarbamylase, 680
Halofenate
*S. cerevisiae* growth and lipid synthesis, 847
Hexose phosphate
*E. coli* mutants, 895
transport mutants, 895
*hisB* gene
histidinol phosphate phosphatase activity, 82
specialized subregions, 82
Histidine operon polarity
*S. typhimurium*, 1207
Histidine uptake
general transport system, 1320
*N. crassa* mutants, 1320
Histidinol phosphate
*hisB* gene, 82
β-Hydroxybutyrate
*A. vinelandii*, 1273
Hydroxykynureninase
occurrence and properties in yeast, 1127
6-(*p*-hydroxyphenylazo)-uracil
*B. subtilis* transformation, 1512
Hydroxyurea
inhibition of DNA synthesis, 263
*S. cerevisiae*, 263
Hysteresis
anthranilate synthase aggregate regulation, 224
*B. subtilis*, 224

Intracytoplasmic membranes
*A. suboxydans*, 1455
Intraperiplasmic development
*B. bacteriovorus*, 1280
Inorganic phosphate transport
*E. coli* genes *phoS* and *phoT*, 529
Invertase
distribution in *Saccharomyces*, 1073
Isoleucine-valine pathway
repression in *S. cerevisiae*, 1333
α-Isopropylmalate synthetase
leucine operon of *E. coli*, 1268

Kasugamycin
*E. coli* resistance, 704
loci for resistance, 704
3-Ketoglucose reductase
*A. tumefaciens*, 652
*Klebsiella*
capsular polysaccharides, 1345
flagellar hooks, 1474
Kynureninase
occurrence and properties in yeast, 1127

*Lactobacillus fermenti*
membrane lipoteichoic acid, 365
Lambda lysogenization
*lon*⁻ *E. coli*, 1326
Lambda phage
*lon*⁻ *E. coli* cell division, 1326
L colonies
morphology and ultrastructure, 1049
*S. aureus*, 1049
Leprosy bacilli
acid-fastness, 1389
acid hematein-positivity, 1389
cytochemical reactions, 1389
Leucine
effect on lysyl-tRNA ligase activity, 167
Leucine operon
*E. coli*, 1268
α-isopropylmalate synthetase, 1268
Leucine pathway
repression in *S. cerevisiae*, 1333
Lipids
*Acholeplasma laidlawii*, 565
*B. ruminicola*, 1121
*M. hominis* membrane, 565

Lipid synthesis
halofenate and clofibrate, 847
*S. cerevisiae*, 847
Lipopolysaccharide
*S. typhimurium* cell wall, 627
Lipoteichoic acid
isolation, 365
*L. fermenti* membrane, 365
*Listeria monocytogenes*
autolysis, 1046
L-form characterization
*B. subtilis*, 486
*lon*⁻ *Escherichia coli*
lambda lysogenization, 1236
Lysogeny
transformation of inhibition, 1217
Lysozyme action
cell viability, 278
low ionic environment, 278
Lysozyme resistance
glucosamine residues, 592
Lysyl-transfer ribonucleic acid
*E. coli* K-12, 167
regulation of ligase activity, 167

Macromolecular composition
effect of growth rate, 203
Macromolecular synthesis
*A. vinelandii*, 841
*S. cerevisiae* germination, 1289
Manganese accumulation
*B. subtilis*, 1373
Manganese transport
*B. subtilis*, 1363
α-Mannosidase
*P. pallidum* microcyst differentiation, 192
Mapping
*E. coli* mutations, 798
Membrane
altered lipids and proteins, 874
*B. subtilis* mutants, 874
Membrane integrity
pantothenate accumulation, 619
Membrane radiosuicide selection
*E. coli* ts mutants, 813
Membrane vesicle transport activity
*B. licheniformis*, 329
Mercuric chloride
volatilization, 1070
Mesosome transport activity
*B. licheniformis*, 329
*Methanobacterium thermoautotrophicum*
fine structure, 461
growth temperature effects, 461
Methionine
enzyme for production of, 218
Methionine enzymes
synthesis in *S. cerevisiae*, 1156
Methionyl transfer ribonucleic acid
*S. cerevisiae*, 1156
Methylated albumin-kieselguhr fractionation
*B. subtilis* DNA, 739, 754
*Methylococcus capsulatus*
primary alcohol dehydrogenase, 937
*m*-Fission
*P. putida* catechol, 922
protocatechuate degradation, 521
*m*-Fission pathway
protocatechuate, 1064
*P. testosteroni*, 1064
*Micrococcus*
lysozyme and low ionic environment, 278
*Micrococcus lysodeikticus*
conductivity and osmolality, 1198
*Micrococcus radiodurans*
thymineless death, 233
UV sensitivity, 233
*Microcyclus*
carbohydrate metabolism pathways, 341
Microcyst differentiation
α-mannosidase activity, 192
*P. pallidum*, 192
Mitochondria
*N. crassa*, 637
succinate oxidase, 637
"Molecular sieve" cell wall layer
*Pseudomonas* sp., 445
Molybdoferredoxin complex
*C. pasteurianum*, 884
subunit isolation, 884
Monosaccharide diffusion
*S. cerevisiae*, 612
Mureins
coryneform bacteria, 8
Mutator genes
*E. coli* K-12, 145
UV sensitivity, 145
Mutator *mutU4*
transduction attempts, 161
*MutU4 polA* inviability, 161
Mycobacteria
acid-fastness, 1389
acid hematein-positivity, 1389
cytochemical reactions, 1389
relationships with nocardiae, 645
*Mycobacterium lepraemurium*
cell wall of strain Hawaii, 515
*"Mycobacterium" pellegrino*
serological study, 1
*"Mycobacterium" rhodochrous*
serological study, 1
*Mycobacterium smegmatis*
genetic recombination, 1104
glycogen synthetase, 863
trehalose, 863
Mycoplasma
acyl carrier protein, 586
membrane $Mg^{2+}$ content, 666
sugar transport, 212
*Mycoplasma hominis*
membrane lipids, 565
microcinematographic studies, 1223
multiplication, 1223
*Myxococcus xanthus*
myxospore germination, 786
Myxospore germination
protein synthesis, 786
RNA, 786

*Neurospora crassa*
aryl sulfatase in ascospores, 519
ascospores, 519
differential gene action, 572
heat treatment, 1509
histidine uptake in mutants, 1320
kynureninase-type enzymes, 1127
nitrous acid treatment, 1509
succinate oxidase, 637
ultrastructure, 1015
UV treatment and viability, 1509
X radiation and viability, 1509
Nigeran
*Aspergillus aculeatus*, 856
Nitrate reductase
*E. coli* membrane, 1264
Nitrate reductase complex
solubilization and resolution, 1264
Nitrogen fixation
*A. vinelandii* cysts, 841
*Nocardia*
relationships with mycobacteria, 645
serological study, 1

Osmolality
*S. faecalis* and *M. lysodeikticus*, 1198

Pantothenate accumulation
*A. tumefaciens*, 619
membrane integrity and fatty acid biosynthesis, 619
Pantothenate-methionine
*P. denitrificans* auxotroph, 218
*Pasteurella pseudotuberculosis*
ADP-glucose:glycogen transglucosylase, 946
*Penicillium chrysogenum*
amino acid transport, 1184
Peptidoglycan
coryneform bacteria, 8
P factor
characterization as supercoiled circular DNA, 763
*V. cholerae*, 763
Phenol
metabolism by *P. putida*, 1112
*Phialophora dermatitidis*
growth kinetics in shaken broth cultures, 468
yeast-to-mold conversion, 468
Phosphate-arsenate interactions
*Rhodotorula rubra*, 599
Phosphate limitation
*B. licheniformis*, 969
Phosphate-limited system
*Rhodotorula rubra*, 599
Phosphocarrier protein
*S. typhimurium* mutant, 512
Phosphoenolpyruvate-dependent phosphotransferase
activity in *Mycoplasma*, 212
α-methyl-D-glucopyranoside uptake, 212
Phosphoglucomutase-deficient mutants
*B. licheniformis*, 969
Phosphohydroxy pyruvate transaminase
*serC* and *serS* linkage, 1091
Photo protection
*B. cereus*, 1058
dipicolinate, 1058
Phycobilisomes
*Anacystis nidulans*, 403
Phycocyanin
*A. nidulans*, 403
Pigment P-503
*E. coli*, 914
Pilus synthesis
pseudo-*fi*$^+$ I-like sex factor, 502
Plasmid F*lac*S
associated functions in *E. coli*, 183
*polA*
inviability with double mutant containing *mutU4*, 161
Polyamine limitation
*E. coli*, 271
Polymixin B sulfate
*Chlamydia psittaci* cell wall, 357
Polynucleotide phosphorylase
*E. coli*, 1235
RNA metabolism in *E. coli*, 1235
Polyribosomes
clostridia, 252
*Polysphondylium pallidum*
α-mannosidase and microcyst differentiation, 192
Porphyrin accumulation
*E. coli* K-12 mutants, 122
mechanism, 122
Precipitation reference systems
serological study of nocardia, 1
Prephenate
mechanism governing metabolic fate, 241
Primary alcohol dehydrogenase
*Methylococcus capsulatus*, 937
*Pseudomonas* sp. M27, 937
Primary alcohol dehydrogenase
serology, 937
Protein synthesis
thymineless death, 711
*Proteus vulgaris*
flagellar hooks, 1474
regulation of flagellar morphogenesis, 295
Protocatechuate
*P. testosteroni m*-fission pathway, 1064
Protocatechuate degradation
*P. testosteroni*, 521
Proton gradient
effect on amino acid transport, 1184
Proton magnetic resonance spectroscopy
*Klebsiella* capsular polysaccharide, 1345
*Prototheca zopfii*
macromolecular composition, 203
*Pseudomonas*
cell wall double-track layer, 445
primary alcohol dehydrogenase, 937
*Pseudomonas acidovorans*
thymidine auxotrophs, 510
*Pseudomonas aeruginosa*
cell surface structure, 963
channel-shuttle mechanism, 241
drug resistance factor, 772

EDTA-extractable cell wall component, 417
freeze-etch study, 417
growth in benzalkonium chloride, 409
phenylalanine and tyrosine synthesis regulation, 241
R factor R1822, 772
spheroplast surface structure, 963
ultrastructure, 963
volatilization of mercuric chloride, 1070
*Pseudomonas denitrificans*
betaine-homocysteine transmethylase, 218
enzyme in methionine production, 218
*Pseudomonas putida*
aromatic compounds, 922
catechol catabolism, 922
metabolism of phenol and cresols, 1112
*Pseudomonas testosteroni*
*m*-fission pathway of protocatechuate, 1064
protocatechuate degradation, 521
Pyrimidine metabolism
pneumococcus, 1348, 1356
Pyruvate carboxylase
*B. stearothermophilus*, 549
physiological role, 549
Pyruvate-uridine diphospho-*N*-acetyl-glucosamine transferase
properties and partial purification, 287
*S. epidermidis*, 287

Quaternary ammonium compounds
bacteria resistant to, 409

Radioresistance
*S. typhimurium* mutants, 133
*recB-recC* nuclease
*E. coli*, 901
X-ray-induced DNA degradation, 901
Recombination
mycobacteria, 1104
"Relaxed" phenotype
*E. coli rel*$^+$ strain, 178
Replica plating
mapping of *E. coli* mutations, 798
Restriction and modification genes
*S. typhimurium*, 724
Reticulate body
polymixin B sulfate, 357
Reversed-phase chromatography
tRNA, 825
R factors
exclusion, 71
drug-resistance determinants, 1026
molecular structure, 1026
*P. aeruginosa*, 772
pseudo-*fi*$^+$ I-like, 502
transfer factor, 1026
L-Rhamnose residues
*S. typhimurium* cell wall, 672
*Rhizobium meliloti*
free-living and nitrogen-fixing forms, 387
ultrastructure, 387
*Rhodotorula rubra*
continuous culture, 599
phosphate-arsenate uptake, 599
phosphate-limited growth, 599
rho factor
extrakaryotic mutation, 1307
*S. cerevisiae*, 1307
Ribonuclease I
polarity of histidine mutants, 1207
*S. typhimurium* mutants lacking, 1207
Ribonucleic acid
*E. coli*, 1177
*E. coli*, *pnp* mutant, 1235
myxospore germination, 786
polyamine limitation, 271
regulation and guanosine tetraphosphate, 697
synthesis regulation, 1177
temperature-sensitive "relaxed" regulation, 178
Ribosomal ribonucleic acid
postmaturational cleavage in *A. nidulans*, 1256
synthesis during *B. subtilis* sporulation, 1296
Ribosomes
clostridia, 252
R-layer
fixation techniques, 953
*rns* mutation
*S. typhimurium* histidine operon, 1207
RPC-2 columns
tRNA analysis, 825
Ruminal bacteria
degradation of aliphatic and aromatic esters, 1170

*Saccharomyces* sp.
flor formation, 1078
invertase distribution, 1073
*Saccharomyces cerevisiae*
acid phosphatase mutant, 727
ascospore wall development, 1054
halofenate and clofibrate treatment, 847
hydroxykynureninase presence, 1127
hydroxyurea, 263
lipid composition during ascus formation, 373
lipid synthesis, 847
macromolecular synthesis during germination, 1289
methionine enzymes, 1156
methionyl tRNA cellular content, 1156
monosaccharide diffusion, 612
repression of isoleucine-valine and leucine pathways, 1333
reversible inhibition of DNA synthesis, 263
rho factor, 1307
threonine deaminase, 1333
*Salmonella*
flagellar hooks, 1474
*Salmonella typhimurium*
cell wall lipopolysaccharide, 672
DNA restriction and modification, 724
*Flac*S plasmid, 183
leucine operon comparison, 1268
galactose permease mutants, 512
*hisB* gene, 82
histidine operon polarity, 1207
radiation-resistant mutants, 133
restriction and modification genes, 724

L-rhamnose residues, 672
ribonuclease I absence, 1207
2-thiazole-DL-alanine inhibition reversal, 504
Self-inhibition
*Dictyostelium discoideum*, 1061
Septation initiation
*B. subtilis* mutant, 985
*serC* and *serS*
linkage, 1091
D-Serine deaminase
cyAMP, 781
*E. coli*, 781
synthesis regulation, 781
*Serratia marcescens*
covalently closed circular DNA, 508
flagellar hooks, 1474
tryptophan synthetase $\alpha$ chain, 1507
Seryl-transfer ribonucleic acid synthetase
*serC* and *serS* linkage, 1091
Sex pilus
alteration and effect of exclusion, 71
Slime mold
$\alpha$-mannosidase and microcyst differentiation, 192
Soil microorganisms
responses to incubation, 1462
Spheroplast
sensitivity to yeast killer factor, 1193
Spheroplast preparation
trypsin, 963
Sphingolipids
*B. ruminicola*, 1121
Spore coat
*B. cereus*, 1134
*B. subtilis*, 313
quantitative immunological assay, 313
Spore germination
*B. subtilis*, 1482
Sporulation
*B. subtilis* mutants, 1034
*C. perfringens*, 932
L-$\alpha$-glycerophosphate, 1034
*Staphylococcus aureus*
competence for transfection, 576
L colonies, 1049
volatilization of mercuric chloride, 1070
*Staphylococcus epidermidis*
pyruvate-UDP-*N*-acetylglucosamine transferase, 287
UDP-GlcNAc-enolpyruvate reductase, 291
Starch biosynthesis
*C. laurentii*, 627
Streptococci group H
transfection, 1505
transformation inhibition, 1217
*Streptococcus*
lysozyme and low ionic environment, 278
*Streptococcus faecalis*
conductivity and osmolality, 1198
fatty acid composition, 38
*Streptococcus faecium*
fatty acid composition, 38
*Streptomyces coelicolor*
comutation, 500
Succinate oxidase
*N. crassa*, 637
Sugar transport
*S. cerevisiae*, 612
Superoxide dismutase
*B. popilliae*, 524
Symbiosis
protozoon, bacteria, and glucose, 834
Symmetry
facilitated diffusion of monosaccharides, 612

T4 phage
colicin K action on *E. coli*, 42
T6 phage
colicin K action on *E. coli*, 42
Temperature sensitivity
*E. coli* K-12, 76
osmotic reversal, 76
Tetrahydroporphyrin
*E. coli*, 914
*Tetrahymena pyriformis*
food web interaction, 834
$\phi$25 phage
adsorption to *B. subtilis*, 198
Con A-treated *B. subtilis*, 198
2-Thiazole-DL-alanine inhibition reversal
*S. typhimurium*, 504
Threonine deaminase
regulatory role in yeast, 1333
Thymidine auxotrophs
*P. acidovorans*, 510
Thymidine triphosphate
incorporation into DNA of spores, 558
Thymineless death
*M. radiodurans*, 233
Thymine starvation
UV sensitivity, 114
T layer
*B. sphaericus*, 1491
phage receptor role, 1491
Transfection
lysogenic *B. subtilis*, 540
physiological and genetic factors, 576
*S. aureus*, 576
Transfer factor $\Delta$
R factor, 1026
Transfer ribonucleic acid
*B. subtilis* spores and exponential cells, 825
reversed-phase chromatography, 825
RPC-2 column analysis, 825
Transformation
inhibition in group H streptococci, 1217
lysogenic *B. subtilis*, 540
UV repair, 88
Transforming deoxyribonucleic acid
*D. pneumoniae*, 718
Translocation factor G
RNA synthesis regulation, 1177
Transport
amino acids, proton gradient role, 1184
*Penicillium*, 1184
Trehalose
*M. smegmatis*, 863

Trypsin
spheroplast preparation, 963
Tryptophan synthetase α chain
amino terminal sequence, 1507
*S. marcescens*, 1507

Ultrastructure
calcium and uranyl ions, 953
gram-negative bacteria, 953
*N. crassa*, 1015
*S. aureus* L colonies, 1049
Ultraviolet radiation
*H. influenzae* DNA dark repair, 1228
Ultraviolet repair
*B. subtilis*, 88
Ultraviolet sensitivity
*E. coli* mutator strain, 145
*M. radiodurans*, 233
thymine starvation, 114
Ultraviolet treatment
*N. crassa* viability, 1509
Uridine-diphosphate-*N*-acetyl-muramyl-peptides
*E. coli* K-12 mutant, 96
Uridine diphospho-*N*-acetylglucosamine-enolpyruvate reductase
properties and partial purification, 291
*S. epidermidis*, 291

*Vibrio cholerae*
fertility factor P, 763
*Vibrio parahaemolyticus*
ecology, 24

D-Xylose catabolism
*A. aerogenes*, 1404

Yeast
contacting-cell structures, 350
Yeast killer factor
resistance to, 1193
Yeast-to-mold conversion
*Phialophora dermatitidis*, 468

Zygosis
*E. coli* conjugation, 58

## INDEX TO DATE OF ISSUE

| Month | Date of Issue | Pages |
|---|---|---|
| January | 6 February 1973 | 1–528 |
| February | 7 March 1973 | 529–1090 |
| March | 27 March 1973 | 1091–1516 |

# JOURNAL

OF

# BACTERIOLOGY

VOLUME 114

BALTIMORE, MD. 21202

1973

# JOURNAL OF BACTERIOLOGY

VOLUME 114

## EDITORIAL BOARD


**L. LEON CAMPBELL**, Editor-in-Chief (1975)
*University of Delaware, Newark*

**R. L. ANDERSON**, Editor (1975)
*Michigan State University, East Lansing*

**ROY CURTISS III**, Editor (1974)
*University of Alabama, Birmingham*

**S. G. BRADLEY**, Editor (1974)
*Virginia Commonwealth University, Richmond*

**ALLEN G. MARR**, Editor (1973)
*University of California, Davis*

**H. E. UMBARGER**, Editor (1976)
*Purdue University, Lafayette, Ind.*

---

**Martin Alexander** (1975)
**W. Lane Barksdale** (1975)
**M. E. Bayer** (1975)
**Blaine Beaman** (1976)
**Claire M. Berg** (1973)
**Richard S. Berk** (1974)
**Robert W. Bernlohr** (1973)
**Herbert W. Boyer** (1975)
**B. Wesley Catlin** (1974)
**D. Joseph Clark** (1974)
**Stanley N. Cohen** (1973)
**Ronald S. Cole** (1974)
**S. F. Conti** (1975)
**Nicholas R. Cozzarelli** (1975)
**Walter J. Dobrogosz** (1973)
**Martin Dworkin** (1973)
**R. G. Eagon** (1974)
**Alan D. Elbein** (1973)
**Wolfgang Epstein** (1974)
**Stanley Falkow** (1975)
**Gerald R. Fink** (1975)
**A. T. Ganesan** (1975)
**Howard Goldfine** (1975)
**Harry Gooder** (1975)
**Joseph S. Gots** (1975)
**Harlyn O. Halvorson** (1975)
**F. M. Harold** (1973)
**George Hegeman** (1974)
**Donald R. Helinski** (1975)
**Charles E. Helmstetter** (1975)
**Robert K. Herman** (1974)
**Joseph T. Holden** (1975)
**Stanley C. Holt** (1974)
**John Ingraham** (1973)
**Sam Kaplan** (1974)
**David E. Kennell** (1974)
**Robert L. Lester** (1975)
**Hillel S. Levinson** (1975)
**E. C. C. Lin** (1975)
**Michael H. Malamy** (1975)
**Manley Mandel** (1975)
**David Mardon** (1974)
**Alvin Markovitz** (1973)
**Neil H. Mendelson** (1975)
**M. L. Morse** (1975)
**Eugene W. Nester** (1975)
**Richard P. Novick** (1973)
**L. Nicholas Ornston** (1975)
**Leo Parks** (1973)
**Martin Pato** (1975)
**Allen T. Phillips** (1973)
**Lewis I. Pizer** (1975)
**Jack Preiss** (1974)
**Charles C. Remsen III** (1973)
**William S. Reznikoff** (1973)
**H. V. Rickenberg** (1973)
**Antonio H. Romano** (1973)
**John Roth** (1973)
**Harold L. Sadoff** (1974)
**M. R. J. Salton** (1975)
**David Schlessinger** (1974)
**Carl Schnaitman** (1974)
**Jane K. Setlow** (1975)
**Helen Jean Shadomy** (1975)
**Stanley K. Shapiro** (1976)
**Simon Silver** (1973)
**W. R. Sistrom** (1975)
**Lucile Smith** (1975)
**Paul S. Sypherd** (1974)
**A. L. Taylor** (1974)
**Donald J. Tipper** (1975)
**Arthur Weissbach** (1974)
**N. E. Welker** (1973)
**Meyer J. Wolin** (1973)
**Frank E. Young** (1973)
**Stanley A. Zahler** (1974)

---

**ROBERT A. DAY**, *Managing Editor, 1913 I St., N.W., Washington, D.C. 20006*

---

## EX OFFICIO

**R. G. E. MURRAY**, President (1972-1973)
**DONALD E. SHAY**, Secretary

**L. LEON CAMPBELL**, Vice-President (1972-1973)
**T. J. CARSKI**, Treasurer



The *Journal of Bacteriology*, a publication of the American Society for Microbiology, 1913 I St., N.W., Washington, D.C. 20006, is devoted to the advancement and dissemination of fundamental knowledge concerning bacteria and other microorganisms. The *Journal* is published monthly, and the twelve numbers are divided into four volumes per year. The subscription price is $75 (Postal Union Countries, $77; other foreign, $78) per year. Single copies are $7.00 (foreign, 7.25). Members of the American Society for Microbiology may receive the *Journal* as part of their dues. Correspondence relating to subscriptions, reprints, defective copies, availability of back issues, lost or late proofs, disposition of submitted manuscripts, and general editorial matters should be directed to the ASM Publications Office, 1913 I St., N.W., Washington, D.C. 20006 (area 202 833-9416). Correspondence from ASM members relating to membership dues, member subscriptions, changes of address, incorrect journals, etc., should be directed to the Executive Secretary, American Society for Microbiology, 1913 I St., N.W., Washington, D.C. 20006. Published monthly by the ASM at 428 E. Preston St., Baltimore, Md. 21202.

---

Second class postage paid at Baltimore, Md. 21202, and at additional mailing offices.

Made in the United States of America.



Copyright © 1973, American Society for Microbiology.
All Rights Reserved.

Volume 114 **Contents for April** Number 1

## Morphology and Ultrastructure

Gram Characteristics and Wall Ultrastructure of *Arthrobacter crystallopoietes* During Coccus-Rod Morphogenesis. C. M. Ward, Jr., and G. W. Claus ..... 378
Proteins Released from Cell Envelopes of *Pseudomonas aeruginosa* on Exposure to Ethylenediaminetetraacetate: Comparison with Dimethylformamide-Extractable Proteins. J. D. Stinnett, H. E. Gilleland, Jr., and R. G. Eagon ..... 399
Miniature Cell Formation in *Chlamydia psittaci*. Yoh Tanami and Yoshitsugu Yamada ..... 408
Electron Micrography of Bud Formation in *Metschnikowia krissii*. L. T. Talens, Mary Miranda, and M. W. Miller ..... 413
Mesosomes in *Pseudomonas aeruginosa*. Hans-Peter Hoffmann, Sam G. Geftic, Hans Heymann, and Frank W. Adair ..... 434
Dipicolinic Acid Location in Intact Spores of *Bacillus megaterium*. Gary Leanz and Charles Gilvarg ..... 455

## Genetics and Molecular Biology

Physiology of *Escherichia coli* K-12 During Conjugation: Altered Recipient Cell Functions Associated with Lethal Zygosis. Ronald A. Skurray and Peter Reeves ..... 11
Genetic Studies Relating to the Production of Transformed Clones Diploid in the Tryptophan Region of the *Bacillus subtilis* Genome. C. Audit and C. Anagnostopoulos ..... 18
Isolation and Properties of a Ribonuclease-Deficient Mutant of *Salmonella typhimurium*. C. Timothy Wehr ..... 96
Genetic Analysis of Ribonucleic Acid Polymerase Mutants of *Bacillus subtilis*. Stephen R. Haworth and Lyle R. Brown ..... 103
Transcription of Spontaneously Released Bacterial Deoxyribonucleic Acid in Frog Auricles. Maurice Stroun and Philippe Anker ..... 114
X-Ray Sensitivity and Repair Capacity of a *polA1 exrA* Strain of *Escherichia coli* K-12. David A. Youngs and Kendric C. Smith ..... 121
Physical Assay of Competence for Specific Mating-Pair Formation in *Escherichia coli*. Roger H. Walmsley ..... 144
Competence for Deoxyribonucleic Acid Uptake and Deoxyribonuclease Action External to Cells in the Genetic Transformation of *Diplococcus pneumoniae*. S. Lacks and B. Greenberg ..... 152
Analysis of Isoaccepting Transfer Ribonucleic Acid Species of *Bacillus subtilis*: Changes in Chromatography of Transfer Ribonucleic Acids Associated with Stage of Development. Barbara S. Vold ..... 178
Isoleucine and Valine Metabolism in *Escherichia coli*. XXI. Mutations Affecting Derepression and Valine Resistance. W. J. Pledger and H. E. Umbarger ..... 183
Isoleucine and Valine Metabolism in *Escherichia coli*. XXII. A Pleiotropic Mutation Affecting Induction of Isomeroreductase Activity. W. J. Pledger and H. E. Umbarger ..... 195
Thymineless Death in *Escherichia coli* in Various Assay Systems: Viability Determined in Liquid Medium. Hiroaki Nakayama and John L. Couch ..... 228
Organic Solvents as Probes for the Structure and Function of the Bacterial Membrane: Effects of Ethanol on the Wild Type and an Ethanol-Resistant Mutant of *Escherichia coli* K-12. Victor A. Fried and Aaron Novick ..... 239
Physiological Modifications in the Production and Repair of Methyl Methane Sulfonate-Induced Breaks in the Deoxyribonucleic Acid of *Escherichia coli* K-12. Dominic A. Scudiero, Benjamin S. Friesen, and Jeremy E. Baptist ..... 267
Fate of Transforming Deoxyribonucleic Acid After Uptake by Competent *Bacillus subtilis*: Phenotypic Characterization of Radiation-Sensitive Recombination-Deficient Mutants. D. Dubnau, R. Davidoff-Abelson, B. Scher, and C. Cirigliano ..... 273
Fraction of Ribosomes Synthesizing Protein as a Function of Specific Growth Rate. R. J. Harvey ..... 287

Control of F'*lac* Replication in *Escherichia coli* B/r. DANIEL B. DAVIS AND CHARLES E. HELMSTETTER ..... 294
Strand-Specific Nick in Open Circular R-Factor Deoxyribonucleic Acid: Attachment of the Linear Strand to a Proteinaceous Cellular Component. C. F. MORRIS, C. L. HERSHBERGER, AND R. ROWND ..... 300
Growth and Initiation of Protein Synthesis in *Escherichia coli* in the Presence of Trimethoprim. R. J. HARVEY ..... 309
A *cis/trans* Test of the Effect of the First Enzyme for Histidine Biosynthesis on Regulation of the Histidine Operon. JOHN S. KOVACH, ANTONIO O. BALLESTEROS, MARILYN MEYERS, MARCO SORIA, AND ROBERT F. GOLDBERGER ..... 351
Deoxyribonucleic Acid Repair in a Highly Radiation-Resistant Strain of *Salmonella typhimurium*. ROLAND DAVIES, ANTHONY J. SINSKEY, AND DAVID BOTSTEIN ..... 357
Extrachromosomal Deoxyribonucleic Acid in Different Enterobacteria. C. CHRISTIANSEN, GUNNA CHRISTIANSEN, A. LETH BAK, AND A. STENDERUP ..... 367
Detection and Characterization of Plasmids in *Pseudomonas aeruginosa* Strain PAO. J. M. PEMBERTON AND ALVIN J. CLARK ..... 424
Cryptic Plasmids in a Minicell-Producing Strain of *Salmonella typhimurium*. RONALD J. SHEEHY, DAVID P. ALLISON, AND ROY CURTISS III ..... 439
Transformation of Germinated Spores of *Bacillus subtilis* on Agar Plates. HIROSHI TANOOKA ..... 445
In Vivo Complementation Between Wild-Type and Mutant β-Galactosidase in *Escherichia coli*. BARRY G. HALL ..... 448

**Physiology and Metabolism**

Study of Phenoloxidase Activity During the Reproductive Cycle in *Schizophyllum commune*. THOMAS J. LEONARD AND LOU ELLEN PHILLIPS ..... 7
Pyridine Nucleotide-Dependent Glucose Dehydrogenase Activity in Blue-Green Algae. WARREN M. PULICH AND CHASE VAN BAALEN ..... 28
Pathway for Ubiquinone Biosynthesis in *Escherichia coli* K-12: Gene-Enzyme Relationships and Intermediates. I. G. YOUNG, P. STROOBANT, C. G. MACDONALD, AND F. GIBSON ..... 42
Sodium and Potassium Requirements for Active Transport of Glutamate by *Escherichia coli* K-12. Y. S. HALPERN, H. BARASH, S. DOVER, AND KARNINA DRUCK ..... 53
Acriflavine Uptake and Resistance in *Serratia marcescens* Cells and Spheroplasts. D. R. WOODS, VALERIE R. SCHAUDER, AND PENELOPE B. WADDINGTON ..... 59
Properties of an Inducible $C_4$-Dicarboxylic Acid Transport System in *Bacillus subtilis*. OM. K. GHEI AND WILLIAM W. KAY ..... 65
Fatty Acid Compositions of Paracolons: *Arizona*, *Citrobacter*, and *Providencia*. NEAL A. MACHTIGER AND WILLIAM M. O'LEARY ..... 80
Nucleotide Pools and Adenylate Energy Charge in Balanced and Unbalanced Growth of *Chromatium*. MARGARET L. MIOVIĆ AND JANE GIBSON ..... 86
Recognition of a Gene Involved in the Regulation of Nicotinamide Adenine Dinucleotide Biosynthesis. GERALD J. TRITZ AND JERRY LR CHANDLER ..... 128
Inducement of a Heat-Shock Requirement for Germination and Production of Increased Heat Resistance in *Bacillus fastidiosus* Spores by Manganous Ions. HATSUO AOKI AND RALPH A. SLEPECKY ..... 137
Selection of Respiratory Mutants of *Neurospora crassa*. DAVID L. EDWARDS, FABIA KWIECINSKI, AND JONATHAN HORSTMANN ..... 164
Tryptophan Biosynthetic Enzymes of *Staphylococcus aureus*. ALAN R. PROCTOR AND WESLEY E. KLOOS ..... 169
Some Characteristics of Tryptophan Uptake in *Claviceps* Species. LARRY W. ROBERTSON, JAMES E. ROBBERS, AND HEINZ G. FLOSS ..... 208
Binding of Radioactive Benzylpenicillin to Asporogenous Mutants of *Bacillus subtilis* During Postexponential Growth. MARVIN ROGOLSKY, PAUL J. LAWRENCE, AND VO THI HANH ..... 220
*Saccharomyces* Mutants with Invertase Formation Resistant to Repression by Hexoses. BLAND S. MONTENECOURT, S.-C. KUO, AND J. O. LAMPEN ..... 233
Methanol Metabolism in Pseudomonad C. B. STIEGLITZ AND R. I. MATELES ..... 390

$CO_2$ Reduction to Formate in *Clostridium acidi-urici*. R. K. THAUER ..... 443
Effects of Temperature Variation on the Fatty Acid Composition of a Psychrophilic *Candida* Species. I. MCMURROUGH AND A. H. ROSE ..... 451
Increase in Sensitivity to Antidiotics and Lysozyme on Deletion of Lipopolysaccharides in *Escherichia coli* Strains. SHIGEO TAMAKI AND MICHIO MATSUHASHI .. 453
Insensitivity of Bacteria to Proposed Antimetabolites of D-Alanyl-D-Alanine. GLEN R. GALE AND ALAYNE B. SMITH ..... 460

**Enzymology**

Nuclear Deoxyribonucleic Acid-Dependent Ribonucleic Acid Polymerases from *Saccharomyces cerevisiae*. JESUS SEBASTIAN, MADHU M. BHARGAVA, AND HARLYN O. HALVORSON ..... 1
Some Properties of the Autolytic *N*-Acetylmuramidase of *Lactobacillus acidophilus*. JACQUES COYETTE AND GERALD D. SHOCKMAN ..... 34
Fatty Acid Activation by a Lipophilic Bacterium. ROBERT CALMES AND S. J. DEAL .. 249
Purification and Properties of a Glycoprotein Acid Phosphatase from *Candida albicans*. FRANK C. ODDS AND JOHN C. HIERHOLZER ..... 257
Biosynthesis of Branched-Chain Amino Acids in *Schizosaccharomyces pombe*: Regulatory Properties of Threonine Deaminase. RODERICK A. MCDONALD AND J. GORDIN KAPLAN ..... 323
Biosynthesis of Branched-Chain Amino Acids in *Schizosaccharomyces pombe*: Properties of Acetohydroxy Acid Synthetase. RODERICK A. MCDONALD, T. SATYANARAYANA, AND J. G. KAPLAN ..... 332
Catalytic Studies on Tryptophanase from *Bacillus alvei*. SALLIE O'NEIL HOCH AND R. D. DEMOSS ..... 341
New Pathway for Nonphosphorylated Degradation of Gluconate by *Aspergillus niger*. T. A. ELZAINY, M. M. HASSAN, AND A. M. ALLAM ..... 457

**Volume 114** **Number 2**

## Contents for May

**Morphology and Ultrastructure**

Structural Difference Between Walls from Hemispherical Caps and Partial Septa of *Bacillus subtilis*. DAVID P. FAN AND BRUCE E. BECKMAN ..... 790
Large Surface Blebs on *Escherichia coli* Heated to Inactivating Temperatures. PAUL SCHEIE AND SUSAN EHRENSPECK ..... 814
Subapical Wall Synthesis and Wall Thickening Induced by Cycloheximide in Hyphae of *Aspergillus nidulans*. E. STERNLICHT, DVORAH KATZ, AND R. F. ROSENBERGER . 819
Ultrastructure of Lipopolysaccharide Isolated from *Treponema pallidum*. SALLY W. JACKSON AND PININA N. ZEY ..... 838

**Genetics and Molecular Biology**

Temperature-Sensitive Initiation of Chromosome Replication in a Mutant of *Bacillus subtilis*. SIMONE J. LAURENT AND FRANCOISE S. VANNIER ..... 474
Isolation and Properties of Fumarate Reductase Mutants of *Escherichia coli*. MARGARET E. SPENCER AND J. R. GUEST ..... 563
Association of Many Regions of the *Bacillus subtilis* Chromosome with the Cell Membrane. ROBERT D. IVARIE AND JACQUES J. PEÑE ..... 571
Stimulation by Cyclic Adenosine Monophosphate of Plasmid Deoxyribonucleic Acid Replication and Catabolite Repression of the Plasmid Deoxyribonucleic Acid-Protein Relaxation Complex. LEONARD KATZ, DAVID T. KINGSBURY, AND DONALD R. HELINSKI ..... 577
Intergeneric Complementation of Anthranilate Synthase Subunits. NANU PATEL, WALTER M. HOLMES, AND JAMES F. KANE ..... 600
Characterization of Polydisperse Closed Circular Deoxyribonucleic Acid Molecules of *Bacillus megaterium*. R. C. HENNEBERRY AND BRUCE C. CARLTON ..... 625

Regulation of *argE-argH* Expression with Arginine Derivatives in *Escherichia coli*: Extreme Non-Uniformity of Repression and Conditional Repressive Action. ARTHUR P. BOLLON AND HENRY J. VOGEL ..... 632
Cyclic Adenosine Monophosphate-Independent Mutants of the Lactose Operon of *Escherichia coli*. RITA ARDITTI, TERRI GRODZICKER, AND JON BECKWITH ..... 652
*Escherichia coli* Mutants Permissive for T4 Bacteriophage with Deletion in *e* Gene (Phage Lysozyme). C. V. SUNDAR RAJ AND H. C. WU ..... 656
D-Serine Transport System in *Escherichia coli* K-12. SHARON D. COSLOY ..... 679
Deoxyribonucleic Acid-Membrane Complexes in the *Bacillus subtilis* Transformation System. DOUGLAS C. DOOLEY AND EUGENE W. NESTER ..... 711
Minicells of *Bacillus subtilis*. JOHN N. REEVE, NEIL H. MENDELSON, SHEILA I. COYNE, LINDA L. HALLOCK, AND ROGER M. COLE ..... 860
Cell Division and Deoxyribonucleic Acid Synthesis After a Nutritional Shift-Up of *Saccharomyces cerevisiae*. G. K. JACOBSON AND L. W. PARKS ..... 876
Selective Autocytotoxicity in a Model System of *Escherichia coli* K-12 Recombinants. DOUGLAS MARTINEZ AND FRANK WHITEHOUSE, JR. ..... 882
Transcriptional Control of the Galactose Operon by the *capR* (*lon*) and *capT* Genes. CHRISTINE E. BUCHANAN, SUI-SHENG HUA, HANNA AVNI, AND ALVIN MARKOVITZ ..... 891
Genetic Analysis of Mating Type and Alkane Utilization in *Saccharomycopsis lipolytica*. JOHN BASSEL AND ROBERT MORTIMER ..... 894

## Physiology and Metabolism

Mutations Affecting Gluconate Metabolism in *Escherichia coli*. ROSA NAGEL DE ZWAIG, NOÉ ZWAIG, TOMÁS ISTÚRIZ, AND REINA S. SANCHEZ ..... 463
Regulatory Mutations Affecting the Gluconate System in *Escherichia coli*. NOÉ ZWAIG, ROSA NAGEL DE ZWAIG, TOMÁS ISTÚRIZ, AND MAGDA WECKSLER ..... 469
Carrier-Mediated Transport of Folate in a Mutant of *Pediococcus cerevisiae*. FREDERIKA MANDELBAUM-SHAVIT AND NATHAN GROSSOWICZ ..... 485
Acid-Base Titration of Streptococci and the Physical States of Intracellular Ions. ROBERT E. MARQUIS, NANCY PORTERFIELD, AND PHILIP MATSUMURA ..... 491
Properties of a D-Glutamic Acid-Requiring Mutant of *Escherichia coli*. E. J. J. LUGTENBERG, H. J. W. WIJSMAN, AND D. VAN ZAANE ..... 499
Macromolecular Syntheses During Germination and Outgrowth of *Bacillus subtilis* Spores. LINDA GARRICK-SILVERSMITH AND ANNAMARIA TORRIANI ..... 507
Inactivation of Aspartic Transcarbamylase in Sporulating *Bacillus subtilis*: Demonstration of a Requirement for Metabolic Energy. LOUISE M. WAINDLE AND R. L. SWITZER ..... 517
Characterization of a Cold-Sensitive *hisW* Mutant of *Salmonella typhimurium*. JEAN E. BRENCHLEY AND J. L. INGRAHAM ..... 528
Osmotic Pressure in *Escherichia coli* as Rendered Detectable by Lysozyme Attack. PAUL SCHEIE ..... 549
Thiosulfate- and Sulfide-Dependent Pyridine Nucleotide Reduction and Gluconeogenesis in Intact *Thiobacillus neapolitanus*. CHARLES W. ROTH, WALTER P. HEMPFLING, JUDITH N. CONNERS, AND WOLF V. VISHNIAC ..... 592
Cell Division of *Escherichia coli*: Control by Membrane Organization. PO C. WU AND ARTHUR B. PARDEE ..... 603
Effects of Mutational Loss of Specific Intracellular Proteases on the Sporulation of *Bacillus subtilis*. JAMES H. HAGEMAN AND BRUCE C. CARLTON ..... 612
Evidence for the Existence of an Aerobic Pathway for Synthesis of Monounsaturated Fatty Acids by *Alcaligenes faecalis*. A. S. GHANEKAR AND P. M. NAIR ..... 618
Role of Intestinal Microflora in the Metabolism of Guanidinosuccinic Acid. SHELDON MILSTIEN AND PETER GOLDMAN ..... 641
Effect of Methionine Sulfoximine and Methionine Sulfone on Glutamate Synthesis in *Klebsiella aerogenes*. JEAN E. BRENCHLEY ..... 666
Metabolism of D-Serine in *Escherichia coli* K-12: Mechanism of Growth Inhibition. SHARON D. COSLOY AND ELIZABETH MCFALL ..... 685

Role of Reduced Exogenous Organic Compounds in the Physiology of the Blue-Green Bacteria (Algae): Photoheterotrophic Growth of a "Heterotrophic" Blue-Green Bacterium. L. O. INGRAM, J. A. CALDER, C. VAN BAALEN, F. E. PLUCKER, AND P. L. PARKER ..... 695
Role of Reduced Exogenous Organic Compounds in the Physiology of the Blue-Green Bacteria (Algae): Photoheterotrophic Growth of an "Autotrophic" Blue-Green Bacterium. L. O. INGRAM, C. VAN BAALEN, AND J. A. CALDER ..... 701
Oxidation of Elemental Sulfur by *Sulfolobus acidocaldarius*. DOUGLAS W. SHIVVERS AND THOMAS D. BROCK ..... 706
Factors Affecting Cellulolysis by *Ruminococcus albus*. W. R. SMITH, IDA YU, AND R. E. HUNGATE ..... 729
Kinetic Studies on the Interaction of Bacteriophage Type 71 Staphylococcal Bacteriocin with Susceptible Bacteria. ADNAN S. DAJANI AND LEWIS W. WANNAMAKER ..... 738
Fermentation of Glucose, Fructose, and Xylose by *Clostridium thermoaceticum*: Effect of Metals on Growth Yield, Enzymes, and the Synthesis of Acetate from $CO_2$. JAN R. ANDREESEN, ANNABELLA SCHAUPP, CHRIS NEURAUTER, ANN BROWN, AND LARS G. LJUNGDAHL ..... 743
Adenine Nucleotide Levels in *Neurospora*, as Influenced by Conditions of Growth and by Metabolic Inhibitors. CLIFFORD L. SLAYMAN ..... 752
Sodium and Other Inorganic Growth Requirements of *Bacteroides amylophilus*. DANIEL R. CALDWELL, MARK KEENEY, JUSTICE S. BARTON, AND JUANITA F. KELLEY ..... 782
Mutant of *Bacillus subtilis* with a Temperature-Sensitive Autolytic Amidase. DAVID P. FAN AND MARY M. BECKMAN ..... 798
*Micrococcus lysodeikticus* Bacterial Walls as a Substrate Specific for the Autolytic Glycosidase of *Bacillus subtilis*. DAVID P. FAN AND MARY M. BECKMAN ..... 804
Changes in Cell Size and Shape Associated with Changes in the Replication Time of the Chromosome of *Escherichia coli*. A. ZARITSKY AND R. H. PRITCHARD ..... 824
A Paracrystalline Inclusion Formed During Sporulation of Enterotoxin-Producing Strains of *Clostridium perfringens* Type A. CHARLES L. DUNCAN, GRETCHEN J. KING, AND WILLIAM R. FRIEBEN ..... 845
Stimulation of Cell Division by Croton Oil in Blue-Green Bacteria. LONNIE O'NEAL INGRAM AND W. D. FISHER ..... 874
Inhibition of Spore Outgrowth and Vegetative Growth of *Bacillus stearothermophilus* by Dipicolinate. MARION L. FIELDS AND HILMER A. FRANK ..... 878
Phosphorylation of Glycerol in *Staphylococcus aureus*. D. P. RICHEY AND E. C. C. LIN ..... 880
Site of Catabolite Inhibition of Carbohydrate Metabolism. JAMES F. MCGINNIS AND KENNETH PAIGEN ..... 885
Influence of Magnesium Ions on Porosity of the *Bacillus megaterium* Cell Wall and Membrane. RENÉ SCHERRER AND PHILIPP GERHARDT ..... 888

## Enzymology

Penicillin-Binding Component of *Bacillus cereus*. RAYMOND F. ATEN AND RICHARD A. DAY ..... 537
Induction of Superoxide Dismutase by Molecular Oxygen. EUGENE M. GREGORY AND IRWIN FRIDOVICH ..... 543
Purification and Properties of Threonine Deaminase from the X-1 Isolate of the Genus *Thermus*. EDWARD H. HIGA AND ROBERT F. RAMALEY ..... 556
Chorismate Mutase from *Streptomyces aureofaciens*: a Heat-Stable Enzyme. HELMUT GÖRISCH AND FRANZ LINGENS ..... 645
Comparison of Acetohydroxy-Acid Synthetases from Two Extreme Thermophilic Bacteria. NENA W. CHIN AND JOHN M. TRELA ..... 674
Membrane Translocation of Mannitol in *Escherichia coli* Without Phosphorylation. ELLEN SOLOMON, KENJI MIYAI, AND E. C. C. LIN ..... 723
Enzyme Complex Which Couples Glycerol-3-Phosphate Dehydrogenation to Fumarate Reduction in *Escherichia coli*. K. MIKI AND E. C. C. LIN ..... 767
Energy-Transducing Adenosine Triphosphatase from *Escherichia coli*: Purification, Properties, and Inhibition by Antibody. RONALD L. HANSON AND EUGENE P. KENNEDY ..... 772

Volume 114

# Contents for June

Number 3

## Morphology and Ultrastructure

Analysis of *Halobacterium halobium* Gas Vesicles. MARK J. KRANTZ AND CLINTON E. BALLOU ..... 1058

Model for the Structure of the Shape-Maintaining Layer of the *Escherichia coli* Cell Envelope. VOLKMAR BRAUN, HELGA GNIRKE, ULF HENNING, AND KURT REHN ..... 1264

Ultrastructural Study of Poly-β-Hydroxybutyrate Granules from *Bacillus cereus*. WINIFRED F. DUNLOP AND A. W. ROBARDS ..... 1271

Relationship of a Wall-Associated Enzyme with Specific Layers of the Cell Wall of a Gram-Negative Bacterium. J. W. COSTERTON ..... 1281

Isolation of Outer Membranes with an Ordered Array of Surface Subunits from *Acinetobacter*. MARGARET J. THORNLEY, AUDREY M. GLAUERT, AND U. B. SLEYTR ..... 1294

Isolation and Characterization of Tubules and Plasma Membranes from *Cytophaga columnaris*. MICHAEL KUHRT AND JACK L. PATE ..... 1309

Microflora of Soil as Viewed by Freeze-Etching. D. L. BALKWILL AND L. E. CASIDA, JR. ..... 1319

Membranes of *Bacillus stearothermophilus*: Factors Affecting Protoplast Stability and Thermostability of Alkaline Phosphatase and Reduced Nicotinamide Adenine Dinucleotide Oxidase. CHARLENE WISDOM AND N. E. WELKER ..... 1336

Surface Structure of Gliding Bacteria After Freeze-Etching. ROBERT P. BURCHARD AND DENNIS T. BROWN ..... 1351

Conjugation in the Dimorphic Chromomycosis Fungus *Phialophora dermatitidis*. KAREN B. OUJEZDSKY AND PAUL J. SZANISZLO ..... 1356

Effects of Toluene and Phenethyl Alcohol on the Ultrastructure of *Escherichia coli*. C. L. WOLDRINGH ..... 1359

## Genetics and Molecular Biology

Genetic Determination of the Constitutive Biosynthesis of Phospho-β-Glucosidase A in *Escherichia coli* K-12. I. PRASAD, B. YOUNG, AND S. SCHAEFLER ..... 909

Polynucleotide Sequence Relationships Among Japanese and American Strains of *Vibrio parahaemolyticus*. T. E. STALEY AND R. R. COLWELL ..... 916

Comparison of the *resA1* and *polA1* Mutations in Isogenic Strains of *Escherichia coli* K-12. BARRY W. GLICKMAN, CORNELIS A. VAN SLUIS, GERDA VAN DER MAAS, AND ARTHUR RÖRSCH ..... 951

Effect of Cycloheximide on L-Leucine Transport by *Penicillium chrysogenum*: Involvement of Calcium. DOUGLAS R. HUNTER, CAROL L. NORBERG, AND IRWIN H. SEGEL ..... 956

Transport of Tricarboxylic Acids in *Salmonella typhimurium*. KO IMAI, TEIJI IIJIMA, AND TAKEZI HASEGAWA ..... 961

Replication of Deoxyribonucleic Acid During the Division Cycle of *Salmonella typhimurium*. STEPHEN COOPER AND THERESE RUETTINGER ..... 966

Transmissible Plasmid Coding Early Enzymes of Naphthalene Oxidation in *Pseudomonas putida*. N. W. DUNN AND I. C. GUNSALUS ..... 974

Regulation of Methionyl-Transfer Ribonucleic Acid Synthetase Formation in *Escherichia coli* and *Salmonella typhimurium*. ERROL R. ARCHIBOLD AND L. S. WILLIAMS ..... 1007

Deoxyribonucleic Acid Synthesis in *recA* and *recB* Derivatives on an *Escherichia coli* K-12 Strain with a Temperature-Sensitive Deoxyribonucleic Acid Polymerase I. M. MONK, J. KINROSS, AND C. TOWN ..... 1014

Distribution of Ribosomal Ribonucleic Acid Cistrons Among Yeast Chromosomes. SIWO R. DE KLOET ..... 1034

Genetic Mutations Affecting the Respiratory Electron-Transport System of the Photosynthetic Bacterium *Rhodopseudomonas capsulata*. BARRY MARRS AND HOWARD GEST ..... 1045
Regulation of Bacteriochlorophyll Synthesis by Oxygen in Respiratory Mutants of *Rhodopseudomonas capsulata*. BARRY MARRS AND HOWARD GEST ..... 1052
Changes in Isozyme Patterns Between Monokaryons and Dikaryons of a Bipolar *Coprinus*. IAN K. ROSS, ELIZABETH M. MARTINI, AND MARILYN THOMAN .... 1083
Deoxyribonucleic Acid Synthesis and Deoxynucleotide Metabolism During Bacterial Spore Germination. PETER SETLOW ..... 1099
Inhibition of Formation of *Escherichia coli* Mating Pairs by f1 and MS2 Bacteriophages as Determined with a Coulter Counter. JONATHAN T. OU ..... 1108
Temperature-Sensitive Mutants for the Replication of Plasmids in *Escherichia coli*: Requirement for Deoxyribonucleic Acid Polymerase I in the Replication of the Plasmid ColE1 . DAVID T. KINGSBURY AND DONALD R. HELINSKI ..... 1116
Location of the SPO2 Attachment Site and the Bryamcin Resistance Marker on the *Bacillus subtilis* Chromosome. ISSAR SMITH AND HARRIET SMITH ..... 1138
Isolation of Deoxyribonucleic Acid Methylase Mutants of *Escherichia coli* K-12. M. G. MARINUS AND N. RONALD MORRIS ..... 1143
Restriction and Modification of Bacteriophage S2 in *Haemophilus influenzae*. ROSA GROMKOVA, JOHN BENDLER, AND SOL GOODGAL ..... 1151
Colicin B: Mode of Action and Inhibition by Enterochelin. SONIA K. GUTERMAN .. 1217
Excretion of Enterochelin by *exbA* and *exbB* Mutants of *Escherichia coli*. S. K. GUTERMAN AND L. DANN ..... 1225
Mapping of Asporogenous Mutations of *Bacillus subtilis*: a Minimum Estimate of the Number of Sporulation Operons. P. J. PIGGOT ..... 1241
Use of Constructed Double Mutants for Determining the Temporal Order of Expression of Sporulation Genes in *Bacillus subtilis*. J. G. COOTE AND J. MANDELSTAM ..... 1254
Molecular Nature of R-Factor Deoxyribonucleic Acid Isolated from *Salmonella typhimurium* Minicells. RONALD J. SHEEHY, ANDERSON PERRY, DAVID P. ALLISON, AND ROY CURTISS III ..... 1328
Isolation and Characterization of Plasmid Deoxyribonucleic Acid from *Streptococcus mutans*. G. M. DUNNY, N. BIRCH, G. HASCALL, AND D. B. CLEWELL ..... 1362

## Physiology and Metabolism

Extractable Lipids of Gram-Negative Marine Bacteria: Phospholipid Composition. JAMES D. OLIVER AND RITA R. COLWELL ..... 897
*S*-Adenosyl Methionine-Mediated Repression of Methionine Biosynthetic Enzymes in *Saccharomyces cerevisiae*. H. CHEREST, Y. SURDIN-KERJAN, J. ANTONIEWSKI, AND H. DE ROBICHON-SZULMAJSTER ..... 928
Teichoic Acid of a Stabilized L-Form of *Streptococcus pyogenes*. BOHDAN M. SLABYJ AND CHARLES PANOS ..... 934
Ammonium Regulation in *Aspergillus nidulans*. J. A. PATEMAN, J. R. KINGHORN, ETTA DUNN, AND E. FORBES ..... 943
Effect of Serine Hydroxamate on Phospholipid Synthesis in *Escherichia coli*. LEWIS I. PIZER AND JOHN P. MERLIE ..... 980
Effect of Iron and Salt on Prodigiosin Synthesis in *Serratia marcescens*. MELVIN P. SILVERMAN AND ELAINE F. MUNOZ ..... 999
Occurrence of Branched-Chain Hydroxy Fatty Acids in *Pseudomonas maltophilia*. C. WAYNE MOSS, S. B. SAMUELS, J. LIDDLE, AND R. M. MCKINNEY ..... 1018
Role of Cyclic Adenosine 3′,5′-Monophosphate in the In Vivo Expression of the Galactose Operon of *Escherichia coli*. LUCIA B. ROTHMAN-DENES, JOANNE E. HESSE, AND WOLFGANG EPSTEIN ..... 1040

Cyclic Adenosine 3′,5′-Monophosphate in *Escherichia coli*. M. J. Buettner, Eva Spitz, and H. V. Rickenberg ..... 1068
Trisporic Acid Biosynthesis in Separate Plus and Minus Cultures of *Blakeslea trispora*: Identification by *Mucor* Assay of Two Mating-Type-Specific Components. Richard P. Sutter, Domenick A. Capage, Thomas L. Harrison, and William A. Keen ..... 1074
Glutamic Acid Decarboxylase in Spores of *Bacillus megaterium* and Its Involvement in Spore Germination. Charlene Wehe Foerster and Harold F. Foerster. 1090
Metabolism of Phosphatidylglycerol, Phosphatidylethanolamine, and Cardiolipin of *Bacillus stearothermophilus*. George L. Card ..... 1125
Lipid Synthesis During Sporulation of *Saccharomyces cerevisiae*. Susan A. Henry and H. O. Halvorson ..... 1158
Osmotic Behavior of Bacterial Protoplasts: Temperature Effects. A. D. Eisenberg and T. R. Corner ..... 1177
Oxygen Toxicity and the Superoxide Dismutase. Eugene M. Gregory and Irwin Fridovich ..... 1193
Early Events in Development of Streptococcal Competence. C. Gomez Leonard ... 1198
Nitrate Reduction and the Growth of *Veillonella alcalescens*. C. B. Inderlied and E. A. Delwiche ..... 1206
Measurement of the Cyanophycin Granule Polypeptide Contained in the Blue-Green Alga *Anabaena cylindrica*. Robert D. Simon ..... 1213
Glucose Fermentation Products of *Ruminococcus albus* Grown in Continuous Culture with *Vibrio succinogenes*: Changes Caused by Interspecies Transfer of $H_2$. E. L. Iannotti, D. Kafkewitz, M. J. Wolin, and M. P. Bryant ..... 1231
Internal Membrane Control in *Azotobacter vinelandii*. Jack L. Pate, Vinod K. Shah, and Winston J. Brill ..... 1346
Polyamines of *Pseudomonas acidovorans*. E. Karrer, R. J. Bose, and R. A. J. Warren ..... 1365

## Enzymology

Ribosomal Ribonucleic Acid-Adenine ($N^6$-) Methylase of *Escherichia coli* Strain B: Ionic and Substrate Site Requirements. W. Marshall Anderson, Jr., Charles N. Remy, and Jerry E. Sipe ..... 988
Properties of a Fructose-1,6-Diphosphate-Activated Lactate Dehydrogenase from *Acholeplasma laidlawii* Type A. Harold Neimark and Ming C. Tung ..... 1025
Reconstitution of Nitrate Reductase Activity and Formation of Membrane Particles from Cytoplasmic Extracts of Chlorate-Resistant Mutants of *Escherichia coli*. C. H. MacGregor and C. A. Schnaitman ..... 1164
Isolation of Two Acetyl Esterases from Extracts of *Bacillus subtilis*. Thomas B. Higerd and John Spizizen ..... 1184

# AUTHOR INDEX

## VOLUME 114


Adair, Frank W., 434
Allam, A. M., 457
Allison, David P., 439, 1328
Anagnostopoulos, C., 18
Anderson, W. Marshall, Jr., 988
Andreesen, Jan R., 743
Anker, Philippe, 114
Antoniewski, J., 928
Aoki, Hatsuo, 137
Archibold, Errol R., 1007
Arditti, Rita, 652
Aten, Raymond F., 537
Audit, C., 18
Avni, Hanna, 891

Bak, A. Leth, 367
Balkwill, D. L., 1319
Ballesteros, Antonio O., 351
Ballou, Clinton E., 1058
Baptist, Jeremy E., 267
Barash, H., 53
Barton, Justice S., 782
Bassel, John, 894
Beckman, Bruce E., 790
Beckman, Mary M., 798, 804
Beckwith, Jon, 652
Bendler, John, 1151
Bhargava, Madhu M., 1
Birch, N., 1362
Bollon, Arthur P., 632
Bose, R. J., 1365
Botstein, David, 357
Braun, Volkmar, 1264
Brenchley, Jean E., 528, 666
Brill, Winston J., 1346
Brock, Thomas D., 706
Brown, Ann, 743
Brown, Dennis T., 1351
Brown, Lyle R., 103
Bryant, M. P., 1231
Buchanan, Christine E., 891
Buettner, M. J., 1068
Burchard, Robert P., 1351

Calder, J. A., 695, 701
Caldwell, Daniel R., 782
Calmes, Robert, 249
Capage, Domenick A., 1074
Card, George L., 1125
Carleton, Bruce, 612, 625
Casida, L. E., Jr., 1319
Chandler, Jerry LR, 128
Cherest, H., 928
Chin, Nena W., 674
Christiansen, C., 367
Christiansen, Gunna, 367
Cirigliano, C., 273
Clark, Alvin J., 424
Claus, G. W., 378
Clewell, D. B., 1362
Cole, Roger M., 860
Colwell, Rita R., 897, 916
Cooper, Stephen, 966
Coote, J. G., 1254
Conners, Judith H., 592
Corner, T. R., 1177
Cosloy, Sharon D., 679, 785
Costerton, J. W., 1281
Couch, John L., 228
Coyette, Jacques, 34
Coyne, Sheila I., 860
Curtiss, Roy, III, 439, 1328

Dajani, Adnan S., 738
Dann, L., 1225
Davidoff-Abelson, R., 273
Davies, Roland, 357
Davis, Daniel B., 294
Day, Richard A., 537
Deal, S. J., 249
de Kloet, Siwo R., 1034
Delwiche, E. A., 1206
DeMoss, R. D., 341
de Robichon-Szulmajster, H., 928
Dooley, Douglas C., 711
Dover, S., 53
Duncan, Charles L., 845
Dunlop, Winifred F., 1271
Druck, Karnina, 53
Dubnau, D., 273
Dunn, Etta, 943
Dunn, N. W., 974
Dunny, G. M., 1362

Eagon, R. G., 399
Edwards, David L., 164
Ehrenspeck, Susan, 814
Eisenberg, A. D., 1177
Elzainy, T. A., 457
Epstein, Wolfgang, 1040

Fan, David P., 790, 798, 804
Fields, Marion L., 878
Fisher, W. D., 874
Floss, Heinz G., 208
Foerster, Charlene Wehe, 1090
Foerster, Harold F., 1090
Forbes, E., 943
Frank, Hilmer A., 878
Fridovich, Irwin, 543, 1193
Frieben, William R., 845
Fried, Victor A., 239
Friesen, Benjamin S., 267

Gale, Glen R., 460
Garrick-Silversmith, Linda, 507
Geftic, Sam G., 434
Gerhardt, Philipp, 888
Gest, Howard, 1045, 1052
Ghanekar, A. S., 618
Ghei, Om. K., 65
Gibson, F., 42
Gibson, Jane, 86
Gilleland, H. E., Jr., 399
Gilvarg, Charles, 455
Glauert, Audrey M., 1294
Glickman, Barry W., 951
Goldberger, Robert F., 351
Goldman, Peter, 641
Gnirke, Helga, 1264
Goodgal, Sol, 1151
Görish, Helmut, 645
Greenberg, B., 152
Gregory, Eugene M., 543, 1193
Grodzicker, Terri, 652
Gromkova, Rosa, 1151
Grossowicz, Nathan, 485
Guest, J. R., 563
Gunsalus, I. C., 974
Guterman, Sonia K., 1217, 1225

Hageman, James H., 612
Hall, Barry G., 448
Hallock, Linda L., 860
Halpern, Y. S., 53
Halvorson, Harlyn O., 1, 1158
Hanh, Vo Thi, 220
Hanson, Ronald L., 772
Harrison, Thomas L., 1074
Harvey, R. J., 287, 309
Hascall, G., 1362
Hasegawa, Takezi, 961
Hassan, M. M., 457
Haworth, Stephen R., 103
Helinski, Donald R., 577, 1116
Helmstetter, Charles E., 294
Hempfling, Walter P., 592
Henneberry, R. C., 625
Henning, Ulf, 1264
Henry, Susan A., 1158
Hershberger, C. L., 300
Hesse, Joanne E., 1040
Heymann, Hans, 434
Hierholzer, John C., 257
Higa, Edward H., 556
Higerd, Thomas B., 1184
Hoch, Sallie O'Neil, 341
Hoffmann, Hans-Peter, 434
Holmes, Walter M., 600
Horstmann, Jonathan, 164
Hua, Sui-Sheng, 891
Hungate, R. E., 729
Hunter, Douglas R., 956

Iannotti, E. L., 1231
Iijima, Teiji, 961
Imai, Ko, 961

Inderlied, C. B., 1206
Ingraham, J. L., 528
Ingram, L. O., 695, 701, 874
Istúriz, Tomás, 463, 469
Ivarie, Robert D., 571

Jackson, Sally W., 838
Jacobson, G. K., 876

Kafkewitz, D., 1231
Kane, James F., 600
Kaplan, J. Gordin, 323, 332
Karrer, E., 1365
Katz, Dvorah, 819
Katz, Leonard, 577
Kay, William W., 65
Keen, William A., 1074
Keeney, Mark, 782
Kelley, Juanita F., 782
Kennedy, Eugene P., 772
King, Gretchen J., 845
Kinghorn, J. R., 943
Kingsbury, David T., 577, 1116
Kinross, J., 1014
Kloos, Wesley E., 169
Kovach, John S., 351
Krantz, Mark J., 1058
Kuhrt, Michael, 1309
Kuo, S.-C., 233
Kwiecinski, Fabia, 164

Lacks, S., 152
Lampen, J. O., 233
Laurent, Simone J., 474
Lawrence, Paul J., 220
Leanz, Gary, 455
Leonard, C. Gomez, 1198
Leonard, Thomas J., 7
Liddle, J., 1018
Lin, E. C. C., 723, 767, 880
Lingens, Franz, 645
Ljungdahl, Lars G., 743
Lugtenberg, E. J. J., 499

Macdonald, C. G., 42
McDonald, Roderick A., 323, 332
McFall, Elizabeth, 685
McGinnis, James F., 885
MacGregor, C. H., 1164
Machtiger, Neal A., 80
McKinney, R. M., 1018
McMurrough, I., 451
Mandelbaum-Shavit, Frederika, 485
Mandelstam, J., 1254
Marinus, M. G., 1143
Markovitz, Alvin, 891
Marquis, Robert E., 491
Marrs, Barry, 1045, 1052
Martinez, Douglas, 882
Martini, Elizabeth M., 1083
Mateles, R. I., 390
Matsuhashi, Michio, 453
Matsumura, Philip, 491
Mendelson, Neil H., 860
Merlie, John P., 980
Meyers, Marilyn, 351
Miki, K., 767
Miller, M. W., 413
Milstien, Sheldon, 641
Miović, Margaret L., 86
Miranda, Mary, 413
Miyai, Kenji, 723
Monk, M., 1014
Montenecourt, Bland S., 233
Morris, C. F., 300
Morris, N. Ronald, 1143
Mortimer, Robert, 894
Moss, C. Wayne, 1018
Munoz, Elaine F., 999

Nagel de Zwaig, Rosa, 463, 469
Nair, P. M., 618
Nakayama, Hiroaki, 228
Neimark, Harold, 1025
Nester, Eugene W., 711
Neurauter, Chris, 743
Norberg, Carol L., 956
Novick, Aaron, 239

Odds, Frank C., 257
O'Leary, William M., 80
Oliver, James D., 897
Ou, Jonathan T., 1108
Oujezdsky, Karen B., 1356

Paigen, Kenneth, 885
Panos, Charles, 934
Pardee, Arthur B., 603
Parker, P. L., 695
Parks, L. W., 876
Pate, Jack L., 1309, 1346
Patel, Nanu, 600
Pateman, J. A., 943
Pemberton, J. M., 424
Peñe, Jacques J., 571
Perry, Anderson, 1328
Phillips, Lou Ellen, 7
Piggot, P. J., 1241
Pizer, Lewis I., 980
Pledger, W. J., 183, 195
Plucker, F. E., 695
Porterfield, Nancy, 491
Prasad, I., 909
Pritchard, R. H., 824
Proctor, Alan R., 169
Pulich, Warren M., 28

Ramaley, Robert F., 556
Reeve, John N., 860
Reeves, Peter, 11
Rehn, Kurt, 1264
Remy, Charles N., 988
Richey, D. P., 880
Rickenberg, H. V., 1068
Robards, A. W., 1271
Robbers, James E., 208
Robertson, Larry W., 208
Rogolsky, Marvin, 220
Rörsch, Arthur, 951
Rose, A. H., 451
Rosenberger, R. F., 819
Ross, Ian K., 1083
Roth, Charles W., 592
Rothman-Denes, Lucia B., 1040
Rownd, R., 300
Ruettinger, Therese, 966

Samuels, S. B., 1018
Sánchez, Reina S., 463
Satyanarayana, T., 332
Schaefler, S., 909
Schauder, Valerie R., 59
Schaupp, Annabella, 743
Scheie, Paul, 549, 814
Scher, B., 273
Scherrer, René, 888
Schnaitman, C. A., 1164
Scudiero, Dominic A., 267
Sebastian, Jesus, 1
Segel, Irwin H., 956
Setlow, Peter, 1099
Shah, Vinod K., 1346
Sheehy, Ronald J., 439, 1328
Shivvers, Douglas W., 706
Shockman, Gerald D., 34
Silverman, Melvin P., 999
Simon, Robert D., 1213
Sinskey, Anthony J., 357
Sipe, Jerry E., 988
Skurray, Ronald A., 11
Slabyj, Bohdan M., 934
Slayman, Clifford L., 752
Slepecky, Ralph A., 137
Sleytr, U. B., 1294
Smith, Alayne B., 460
Smith, Harriet, 1138
Smith, Issar, 1138
Smith, Kendric C., 121
Smith, W. R., 729
Solomon, Ellen, 723
Soria, Marco, 351
Spencer, Margaret E., 563
Spitz, Eva, 1068
Spizizen, John, 1184
Staley, T. E., 916
Stenderup, A., 367
Sternlicht, E., 819
Stieglitz, B., 390
Stinnett, J. D., 399
Stroobant, P., 42
Stroun, Maurice, 114
Sundar Raj, C. V., 656
Surdin-Kerjan, Y., 928
Sutter, Richard P., 1074
Switzer, R. L., 517
Szaniszlo, Paul J., 1356

Talens, L. T., 413
Tamaki, Shigeo, 453
Tanami, Yoh, 408

Tanooka, Hiroshi, 445
Thauer, R. K., 443
Thoman, Marilyn, 1083
Thornley, Margaret J., 1294
Torriani, Annamaria, 507
Town, C., 1014
Trela, John M., 674
Tritz, Gerald J., 128
Tung, Ming C., 1025

Umbarger, H. E., 183, 195

Van Baalen, Chase, 28, 695, 701
van der Maas, Gerda, 951
Vannier, Francoise S., 474
van Sluis, Cornelis A., 951
van Zaane, D., 499
Vishniac, Wolf V., 592
Vogel, Henry J., 632
Vold, Barbara S., 178

Waddington, Penelope B., 59
Waindle, Louise M., 517
Walmsley, Roger H., 144
Wannamaker, Lewis, 738
Ward, C. M., Jr., 378
Warren, R. A. J., 1365
Wecksler, Magda, 469
Wehr, C. Timothy, 96
Welker, N. E., 1336
Whitehouse, Frank, Jr., 882
Wijsman, H. J. W., 499
Williams, L. S., 1007
Wisdom, Charlene, 1336
Woldringh, C. L., 1359
Wolin, M. J., 1231
Woods, D. R., 59
Wu, H. C., 656
Wu, Po Chi, 603

Yamada, Yoshitsugu, 408
Young, B., 909
Young, I. G., 42
Youngs, David A., 121
Yu, Ida, 729

Zaritsky, A., 824
Zey, Pinina N., 838
Zwaig, Noé, 463, 469

# SUBJECT INDEX

## VOLUME 114


Acetohydroxy-acid synthetase
*Bacillus* sp., 674
branched-chain amino acid synthesis, 332
*S. pombe*, 332
*T. aquaticus*, 674
Acetyl esterases
*B. subtilis*, 1184
*Acholeplasma laidlawii*
lactate dehydrogenase, 1025
Acid inhibition
streptococcal growth, 491
*Acinetobacter* sp.
outer membranes, 1294
Acriflavine
*S. marcescens*, 59
Acyl-coenzyme A synthetase
characterization in *N. asteroides*, 249
Adenine nucleotide
*Neurospora*, 752
Adenine nucleotide pools
*Chromatium* growth, 86
Adenosine triphosphatase
antibody inhibition, 772
*E. coli*, 772
*S*-Adenosyl methionine
methionine biosynthetic enzymes, repression of, 928
*S. cerevisiae*, 928
Adenylate energy charge
*Chromatium* growth, 86
*Agmenellum quadruplicatum*
croton oil and cell division, 874
photoheterotrophic growth, 701
*Alcaligenes faecalis*
fatty acids, 618
Alkaline phosphatase
pseudomonad cell wall, 1281
Amidase mutant
*B. subtilis*, 798
Ammonium regulation
*A. nidulans*, 943
*Anabaena cylindrica*
cyanophycin granule, 1213
Anthranilate synthase
*B. subtilis*, 600
complementation, intergeneric, 600
*P. aeruginosa*, 600
Antimetabolites of D-alanyl-D-alanine
bacterial insensitivity, 460
Arginine restriction
*E. coli*, 632
*Arizona arizonae*
fatty acid composition, 80
*Arthrobacter crystallopoietes*
wall ultrastructure and Gram characteristics, 378
Aspartic transcarbamylase
*B. subtilis* sporulation, 517
*Aspergillus nidulans*
ammonium regulation, 943
cycloheximide treatment of hyphae, 819
subapical walls, 819
*Aspergillus niger*
gluconate degradation (nonphosphorylated), 457
Autocytotoxicity
*E. coli*, 882
Autolysin
*L. acidophilus*, 34
Autolytic *N*-acetylmuramidase
*L. acidophilus*, 34
*Azotobacter vinelandii*
membrane control, 1346

*Bacillus alvei*
tryptophanase, 341
*Bacillus cereus*
penicillin-binding component, 537
poly-β-hydroxybutyrate granules, 1271
*Bacillus fastidiosus*
spore germination, 137
*Bacillus megaterium*
circular DNA, 625
dipicolinic acid location in spores, 455
glutamic acid decarboxylase in spores, 1090
protoplasts and temperature, 1177
spore germination, 1090
*Bacillus stearothermophilus*
dipicolinate treatment, 878
membranes, 1336
phospholipid metabolism, 1125
*Bacillus subtilis*
acetyl esterases, 1184
amidase mutant, 798
anthranilate synthase, 600
aspartic transcarbamylase inactivation, 517
benzylpenicillin (radioactive) binding, 220
bryamycin resistance marker, 1138
$C_4$-dicarboxylic acid transport system, 65
chromosome regions and cell membrane, 571
chromosome replication initiation, 474
clones diploid in the tryptophan region, 18
DNA-membrane complexes, 711
glycosidase, 804
minicells, 860
oxygen toxicity, 1193
protease-deficient mutants, 612
recombination-deficient mutants, 273
RNA polymerase mutants, 103
SPO2 attachment site, 1138
spore germination, 507
spore outgrowth, 507
sporulation genes temporal order of expression, 1254
sporulation in protease-deficient mutant, 612
sporulation operons, 1241

superoxide dismutase, 1193
transformation of germinated spores, 445
tRNA changes as a function of development, 178
walls, end and septal, 790
Bacteriochlorophyll
*R. capsulata* mutants, 1052
synthesis regulation, 1052
Bacteriocin, staphylococcal
interaction with susceptible bacteria, 738
*Bacteroides amylophilus*
sodium and other growth requirements, 782
Benzylpenicillin (radioactive)
binding to *B. subtilis* mutants, 220
*Blakeslea trispora*
trisporic acid identification, 1074
Blebs
*E. coli*, 814
Blue-green algae
GPND, 28
Blue-green bacteria
cell division stimulation, 874
croton oil, 874
photoheterotrophic growth, 695, 701
Bryamycin resistance marker
*B. subtilis*, 1138
Bud formation
*M. krissii*, 413

Calcium
L-leucine transport, 956
*Candida albicans*
glycoprotein acid phosphatase, 257
*Candida* sp., psychrophilic
temperature variation on fatty acid composition, 451
Carbohydrate metabolism
catabolite inhibition site, 885
Cardiolipin
*B. stearothermophilus*, 1125
Catabolite inhibition
carbohydrate metabolism, 885
Cell envelopes
proteins, extractable, 399
Cellulolysis
*R. albus*, 729
Cell walls
*A. crystallopoietes*, 378
*Chlamydia psittaci*
miniature cell formation, 408
Chlorate resistance
*E. coli* mutants, 1164
Chorismate mutase
*S. aureofaciens*, 645
*Chromatium* sp.
adenylate energy, 86
growth, 86
nucleotide pools, 86
Chromosome replication initiation
*B. subtilis*, 474
Chromosome replication time
*E. coli*, 824
Circular deoxyribonucleic acid
*B. megaterium*, 625
Circular R-factor deoxyribonucleic acid
*P. mirabilis*, 300
*cis/trans* Test
histidine operon, 351
*Citrobacter freundii*
fatty acid composition, 80
*Claviceps* sp.
typtophan uptake, 208
*Clostridium acidi-urici*
$CO_2$ reduction to formate, 443
*Clostridium perfringens*
paracrystalline inclusion, 845
sporulation, 845
*Clostridium thermoaceticum*
enzymes, 743
growth, 743
Cold sensitivity
*S. typhimurium hisW* mutant, 528
Colicin B
*E. coli*, 1217
enterochelin, 1217
Colicin E1 plasmid
replication, 1116
Colicins E1 and E2
synthesis regulation, 577
Competence
streptococci, 1198
Complementation, intergeneric
anthranilate synthase subunits, 600
*Coprinus* sp.
isozyme patterns, 1083
mono- and dikaryons, 1083
Croton oil
*A. quadruplicatum*, 874
blue-green bacteria, 874
cell division stimulation, 874
Cryptic plasmids
*S. typhimurium*, 439
Cyanophycin granule
*A. cylindrica*, 1213
Cyclic adenosine monophosphate
*E. coli*, 1068
plasmid DNA, 577
Cycloheximide
*A. nidulans* hyphae, 819
L-leucine transport, 956
*Cytophaga columnaris*
tubules and plasma membranes, 1309

Deoxyribonucleic acid
*B. megaterium* spore germination, 1099
*B. subtilis* recombination-deficient mutants, 273
*E. coli* treated with MMS, 267
enterobacteria, 367
extrachromosomal, 367
methylase mutants, 1143
MMS-induced breaks, 267
*S. cerevisiae* nutritional shift-up, 876
*S. mutans* plasmid, 1362
*S. typhimurium* division, 966
transcription, 114
Deoxyribonucleic acid-dependent ribonucleic acid polymerase
*S. cerevisiae*, 1

Deoxyribonucleic acid-membrane complex
*B. subtilis*, 711
Deoxyribonucleic acid methylase mutants
*E. coli*, 1143
Deoxyribonucleic acid polymerase I
*E. coli recA* and *recB* derivatives, 1014
plasmid replication, 1116
Deoxyribonucleic acid repair
*S. typhimurium*, 357
Dicarboxylic acid transport
*B. subtilis*, 65
Dikaryon (*Coprinus*)
isozyme pattern, 1083
Dipicolinate
*B. stearothermophilus*, 878
Dipicolinic acid
*B. megaterium* spores, 455
*Diplococcus pneumoniae*
competence and DNase, 152
transformation, 152

Electron transport system
*R. capsulata* mutant, 1045
Enterobacteria
DNA (extrachromosomal), 367
Enterochelin
colicin B, 1217
*E. coli*, 1217, 1225
*Escherichia coli*
adenosine triphosphatase, 772
*argE-argH* expression, 632
arginine restriction, 632
autocytotoxicity, 882
blebs, 814
c-AMP, 1068
c-AMP effects on plasmid DNA, 577
cell division, 603
chlorate-resistant mutants, 1164
chromosome replication time, 824
colicin B, 1217
complementation between wild type and mutant β-galactosidase, 448
conjugation and lethal zygosis, 11
DNA breaks, 267
DNA methylase mutants, 1143
DNA polymerase I, 1014
enterochelin, 1217, 1225
ethanol treatment, 239
F′*lac* replication, 294
fumarate reductase mutants, 563
galactose operon, 891, 1040
gluconate metabolism in mutants, 463, 469
glutamate active transport, 53
D-glutamic acid auxotroph, 499
G3P-fumarate coupling, 769
isoleucine metabolism, 183, 195
isomeroreductase induction, 195
lactose operon, 652
lethal zygosis and conjugation, 11
lipopolysaccharide deletion, 453
mannitol membrane translocation, 723
mating-pair formation, 144
mating-pair inhibition, 1108
methionyl-tRNA synthetase, 1007
MMS treatment, 267
murein structural model, 1264
NAD synthesis regulation, 128
osmotic pressure, 549
oxygen toxicity, 1193
phenethyl alcohol treatment, 1359
phospho-β-glucosidase A, 909
phospholipid synthesis, 980
plasmid replication, 1116
*polA1* and *resA1*, 951
*polA1 exrA* X-ray sensitivity, 121
protein initiation, 309
*recA* and *recB* derivatives, 1014
regulatory mutant of gluconate, 469
*resA1* and *polA1* mutations, 951
ribosomes synthesizing protein, 287
rRNA-adenine ($N^6$-) methylase, 988
D-serine transport, 679
superoxide dismutase, 543, 1193
T4*e*$^-$-sensitive mutants, 656
thymineless death, 228
toluene treatment, 1359
trimethoprim, 309
T4*t*$^-$-sensitive mutants, 656
ubiquinone biosynthesis, 42
valine metabolism, 183, 195
Ethanol
*E. coli* treated with, 239
Extractable proteins
EDTA and DMF, 399
*P. aeruginosa*, 399

Fatty acids
activation, 249
*A. faecalis*, 618
*Candida* sp., psychrophilic, 451
*N. asteroides*, 249
paracolons, 80
*P. maltophilia*, 1018
synthesis by *A. faecalis*, 618
temperature variation, 451
Fermentation products
*R. albus*, 1231
F′*lac* replication
*E. coli*, 294
Folate
carrier-mediated transport, 485
*P. cerevisiae*, 485
Formate
formation from $CO_2$ in *C. acidi-urici*, 443
f1 Phage
mating pair inhibition, 1108
Freeze-etching
gliding bacteria, 1351
soil microflora, 1319
Frog auricles
transcription of bacterial DNA, 114
Fumarate reductase
*E. coli* mutants, 563
Fumarate reduction
glycerol-3-phosphate dehydrogenation, 767

Galactose operon
c-AMP, 1040
*E. coli*, 891, 1040
transcriptional control, 891

β-Galactosidase
complementation between *E. coli* wild type and mutant, 448
Gas vesicles
*H. halobium*, 1058
Gliding bacteria
surface structure after freeze-etching, 1351
Gluconate
*A. niger*, 457
degradation, nonphosphorylated, 457
*E. coli* mutant, 463, 469
Gluconeogenesis
*T. neapolitanus*, 592
Glutamate
*E. coli* mutant, 499
Glutamate synthesis
*K. aerogenes*, 666
Glutamate transport
*E. coli*, 53
sodium and potassium requirements, 53
Glycerol-3-phosphate dehydrogenation
fumarate reduction, 767
Glycerol phosphorylation
*S. aureus*, 880
Glycoprotein acid phosphatase
*C. albicans*, 257
Glycosidase
*B. subtilis*, 804
Guanidinosuccinic acid metabolism
microflora, intestinal, 641

*Haemophilus influenzae*
restriction modification, 1151
*Halobacterium halobium*
gas vesicles, 1058
Hexose phosphate synthetase
pseudomonad C, 390
Hexose repression
*Saccharomyces* mutants, 233
Histidine biosynthesis
*cis/trans* test of first enzyme effect, 351
*S. typhimurium*, 351
Histidine operon
regulation and *cis/trans* test, 351
Hyphae
cycloheximide treatment, 819

Inositol-less death
respiratory mutant selection, 164
Intestinal microflora
guanidinosuccinic acid, 641
Isoleucine metabolism
*E. coli* mutant, 183, 195
Isomeroreductase induction
*E. coli* mutant, 195
genetics, 195

*Klebsiella aerogenes*
glutamate synthesis, inhibition, 666

Lactate dehydrogenase
*A. laidlawii*, 1025
*Lactobacillus acidophilus*
autolysin, 34
autolytic *N*-acetylmuramidase, 34
Lactose operon
*E. coli* mutants, 652
Lethal zygosis
*E. coli* conjugation, 11
L-Leucine transport
calcium, 956
cycloheximide, 956
*P. chrysogenum*, 956
L-Form
*S. pyogenes*, 934
teichoic acid of, 934
Lipid synthesis
*S. cerevisiae* sporulation, 1158
Lipopolysaccharide
*E. coli* sensitivity to antibiotics and lysozyme, 453
*T. pallidum*, 838

Macromolecular synthesis
*B. subtilis* spores, 507
Manganous ions
heat-shock requirement, 137
Mannitol
*E. coli*, 723
membrane translocation, 723
Mating-pair formation
competence, 144
*E. coli*, 144
Membrane
*Acinetobacter*, 934
*B. stearothermophilus*, 1336
Membrane-binding sites
*B. subtilis*, 571
Membrane control
*A. vinelandii*, 1346
Mesosomes
*P. aeruginosa*, 434
Methanol metabolism
pseudomonad C, 390
Methionine sulfone
glutamate synthesis, 666
Methionine sulfoximine
glutamate synthesis, 666
Methionyl-transfer ribonucleic acid synthetase
*E. coli*, 1007
*S. typhimurium*, 1007
Methyl methane sulfonate
DNA breaks, 267
*E. coli* treated with, 267
*Metschnikowia krissii*
bud formation, 413
*Micrococcus lysodeikticus*
*B. subtilis* glycosidase, 804
walls as specific substrate, 804
Minicells
*B. subtilis*, 860
Mitochondrial respiration
*N. crassa* mutants, 164
Monokaryon (*Coprinus*)
isozyme pattern, 1083
MS2 phage
mating pair inhibition, 1108
Murein
*E. coli*, 1264
structural model, 1264

Naphthalene oxidation
plasmid coding, 974
*P. putida*, 974
*Neurospora* sp.
adenine nucleotide levels, 752
*Neurospora crassa*
respiratory mutants, 164
"Neutral" protease
*B. subtilis* mutant, 612
Nicotinamide adenine dinucleotide
synthesis regulation, 128
Nitrate reductase activity
chlorate-resistant mutants, 1164
*E. coli* mutants, 1164
Nitrate reduction
*V. alcalescens*, 1206
*Nocardia asteroides*
fatty acid activation, 249
*Nostoc* sp.
photoheterotrophic growth, 695

Osmotic pressure
*E. coli*, 549
Osmotic properties
*B. megaterium* protoplasts, 1177
Outer membranes
*Acinetobacter*, 1294
Oxygen induction
superoxide dismutase, 543
Oxygen toxicity
*E. coli* and *B. subtilis*, 1193

Paracolons
fatty acid composition, 80
Paracrystalline inclusion
*C. perfringens* sporulation, 845
*Pediococcus cerevisiae*
folate transport, 485
Penicillin-binding component
*B. cereus*, 537
*Penicillium chrysogenum*
L-leucine transport, 956
Phenethyl alcohol treatment
*E. coli*, 1359
Phenoloxidase activity
*S. commune* reproductive cycle, 7
*Phialophora dermatitidis*
conjugation, 1356
Phosphatidylethanolamine metabolism
*B. stearothermophilus*, 1125
Phosphatidylglycerol metabolism
*B. stearothermophilus*, 1125
Phospho-β-glucosidase A
constitutive biosynthesis, 909
*E. coli*, 909
genetic determination, 909
Phospholipid
gram-negative marine bacteria, 897
Phospholipid metabolism
*B. stearothermophilus*, 1125
Photoheterotrophic growth
*A. guadruplicatum*, 701
*Nostoc* sp., 695
Plasma membranes
*C. columnaris*, 1309
Plasmid
*P. aeruginosa*, 424
Plasmid deoxyribonucleic acid
c-AMP, 577
*S. mutans*, 1362
Plasmid deoxyribonucleic acid-protein relaxation complex
c-AMP, 577
Plasmid replication
*E. coli*, 1116
*polA1* and *resA1* mutations
*E. coli* K-12, 951
Polyamines
*P. acidovorans*, 1365
Poly-β-hydroxybutyrate granules
*B. cereus*, 1271
Polynucleotide sequence
*V. parahaemolyticus* strains, 916
Prodigiosin synthesis
iron and salt concentration, 999
*S. marcescens*, 999
Protease
*B. subtilis* mutant, 612
Protein synthesis
*E. coli* ribosomes, 287
Proteolytic enzymes
*B. subtilis* sporulation, 1184
*Proteus mirabilis*
circular R-factor DNA, 300
Protoplasts
temperature effects, 1177
*B. megaterium*, 1177
*Providencia alcalifaciens*
fatty acid composition, 80
Pseudomonad C
hexose phosphate synthetase, 390
methanol metabolism, 390
*Pseudomonas* sp.
alkaline phosphatase, 1281
wall-associated enzyme, 1281
*Pseudomonas acidovorans*
polyamines, 1365
*Pseudomonas aeruginosa*
anthranilate synthase, 600
mesosomes, 434
plasmids, 424
proteins, extractable, 399
*Pseudomonas maltophilia*
branched-chain hydroxy fatty acids, 1018
*Pseudomonas putida*
naphthalene oxidation, 974
plasmid coding enzymes, 974
Pyridine nucleotide-dependent glucose dehydrogenase activity
blue-green algae, 28
Pyridine nucleotide reduction
sulfide dependence, 592
*Thiobacillus neapolitanus*, 592
thiosulfate dependence, 592

Regulatory mutant
*E. coli* gluconate system, 469
gluconate system, 469
Replication initiation
*B. subtilis*, 474

*resA1* and *polA1* mutations
*E. coli* K-12, 951
Respiratory electron transport system
*R. capsulata*, 1045
Respiratory mutants
*N. crassa*, 164
Restriction modification
*H. influenzae*, 1151
Reticulate body formation
*C. psittaci*, 408
R-factor deoxyribonucleic acid
*P. mirabilis*, 300
*S. typhimurium*, 1328
*Rhadopseudomonas capsulata*
bacteriochlorophyll synthesis, 1052
respiratory electron transport system, 1045
Ribonuclease I
*S. typhimurium* mutant, 96
Ribonucleic acid
*B. subtilis* polymerase mutants, 103
polymerase mutants, 103
Ribonucleic acid polymerase
yeast nuclei, 1
Ribosomal ribonucleic acid-adenine ($N^6$-) methylase
*E. coli*, 988
Ribosomal ribonucleic acid cistrons
yeast chromosomes, 1034
Ribosomes
*E. coli*, 287
protein synthesis and growth rate, 287
*Ruminococcus albus*
cellulolysis, 729
glucose fermentation products, 1231

*Saccharomyces carlsbergensis*
rRNA cistrons, 1034
*Saccharomyces cerevisiae*
*S*-adenosyl methionine-mediated repression, 928
cell division after nutritional shift-up, 876
DNA-dependent RNA polymerase, 1
DNA synthesis after nutritional shift-up, 876
methionine biosynthetic enzymes, 928
nutritional shift-up, 876
sporulation and lipid synthesis, 1158
*Saccharomyces* mutants
hexose repression, 233
*Saccharomycopsis lipolytica*
genetic analysis, 894
*Salmonella typhimurium*
cryptic plasmids, 439
division cycle DNA replication, 966
DNA repair, 357
histidine operon, 351
*hisW* mutant, 528
methionyl-tRNA synthetase, 1007
minicells containing R-factor DNA, 956
RNase-deficient mutant, 96
tricarboxylic acid transport, 961
*Schizophyllum commune*
phenoloxidase activity, 7
reproductive cycle, 7
*Schizosaccharomyces pombe*
acetohydroxy acid synthetase, 332
branched-chain amino acid synthesis, 323, 332
threonine deaminase, 323
Septal walls
*B. subtilis*, 790
Serine hydroxamate
*E. coli* phospholipid synthesis, 980
phospholipid synthesis, 980
D-Serine transport
*E. coli*, 679
*Serratia marcescens*
acriflavine uptake and resistance, 59
prodigiosin synthesis, 999
Soil microflora
freeze-etching, 1319
SPO2 attachment site
*B. subtilis*, 1138
Spore germination
*B. fastidiosus*, 137
*B. megaterium*, 1090, 1099
glutamic acid decarboxylase, 1090
heat-shock requirement, 137
Sporulation
lipid synthesis, 1158
*S. cerevisiae*, 1158
Sporulation genes
*B. subtilis*, 1254
temporal order of expression, 1254
Sporulation operons
*B. subtilis*, 1241
*Staphylococcus aureus*
glycerol phosphorylation, 880
tryptophan biosynthetic enzymes, 169
*Streptococcus* sp.
competence, 1198
intracellular ions, 491
titration, 491
*Streptococcus faecalis*
superoxide dismutase induction, 543
*Streptococcus mutans*
plasmid DNA, 1362
*Streptococcus pyogenes*
L-form, 934
teichoic acid of L-form, 934
*Streptomyces aureofaciens*
chorismate mutase, 645
*Sulfolobus acidocaldarius*
sulfur oxidation, 706
Sulfur oxidation
*S. acidocaldarius*, 706
Superoxide dismutase
*E. coli*, 543
*E. coli* and *B. subtilis*, 1193
induction by $O_2$, 543
*S. faecalis*, 543

Teichoic acid
*S. pyogenes* L-form, 934
Tetrazolium dye
respiratory mutant selection, 164
*Thermus* sp.
threonine deaminase, 556
*Thermus aquaticus*
acetohydroxy-acid synthetase, 674
*Thiobacillus neapolitanus*

gluconeogenesis, 592
pyridine nucleotide reduction, 592
Threonine deaminase
branched-chain amino acid synthesis, 323
purification and properties, 556
*S. pombe*, 323
*Thermus* sp. 556
Thymineless death
assay systems, 228
*E. coli*, 228
Toluene treatment
*E. coli*, 1359
Transcription
bacterial DNA in frog auricles, 114
Transfer ribonucleic acid
*B. subtilis*, 178
changes as a function of development, 178
Transformation
*B. subtilis* germinated spores, 445
competence and DNase, 152
*D. pneumoniae*, 152
*Treponema pallidum*
lipopolysaccharide, 838
Tricarboxylic acid
*S. typhimurium*, 961
Tricarboxylic acid cycle
$C_4$-dicarboxylic acid transport, 65
Trimethoprim
*E. coli*, 309
protein initiation, 309
Trisporic acid
*Blakeslea trispora*, 1074
mating-type-specific components, 1074
*Mucor* assay, 1074
Tryptophanase
*B. alvei*, 341
catalytic studies, 341
Tryptophan enzymes
*S. aureus*, 169
Tryptophan genome region
*B. subtilis*, 18
Tryptophan uptake
*Claviceps* sp., 208
Tubules
*C. columnaris*, 1309

Ubiquinone biosynthesis
*E. coli*, 42
gene-enzyme relationships, 42
intermediates, 42

Valine metabolism
*E. coli*, 183, 195
*Veillonella alcalescens*
nitrate reduction and growth, 1206
*Vibrio parahaemolyticus*
polynucleotide sequence, 916

Zygosis (lethal)
*E. coli* conjugation, 11